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94th Congress }
2d Session }

COMMITTEE PRINT

EARLY STORAGE RESERVE PLAN

(Public Law 94–163, Section 155)

PRINTED AT THE REQUEST OF

HENRY M. JACKSON, Chairman
COMMITTEE ON INTERIOR AND
INSULAR AFFAIRS
UNITED STATES SENATE

PURSUANT TO

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THE NATIONAL FUELS AND ENERGY
POLICY STUDY

AND

HARLEY O. STAGGERS, Chairman
COMMITTEE ON INTERSTATE AND
FOREIGN COMMERCE
HOUSE OF REPRESENTATIVES

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MEMORANDUM OF THE CHAIRMAN

To Members and Ex-Officio Members of the Senate Committee on Interior and Insular Affairs National Fuels and Energy Policy Study, Pursuant to Senate Resolution 45 (92d Congress) and the House Committee on Interstate and Foreign Commerce:

The Energy Policy and Conservation Act passed by the 94th Congress provided for the creation of a Strategic Petroleum Reserve of up to 1 billion barrels of crude oil and petroleum products.

The purpose of establishing the Reserve is not only to minimize the impact of curtailed oil imports but also to deter the use of such curtailments as political weapons in the future.

As part of the Strategic Petroleum Reserve, Congress required the establishment of an Early Storage Reserve containing not less than 150 million barrels of crude oil and petroleum products within 3 years of the date of the enactment of the Energy Policy and Conservation Act, December 22, 1975. The Act required the Administrator of the Federal Energy Administration to submit an Early Storage Reserve Plan within 90 days of enactment detailing his proposals for implementing the Early Storage Reserve requirements. The Plan was finally submitted to Congress on April 22, 1976.

The Energy Storage Reserve Plan will be followed by the overall Strategic Petroleum Reserve Plan, which must be transmitted to Congress not later than December 15, 1976. Unlike the overall Plan, which does not take effect unless neither House of Congress has disapproved it, the Early Storage Reserve Plan can be implemented immediately.

There is general agreement that the volume of oil imports will continue to grow in the next 10 years. As a share of demand, such imports are unlikely to drop below 40 percent and could go as high as 50 percent. Given this degree of dependence on imports, the need to create an effective Strategic Petroleum Reserve is greater than ever. The Early Storage Reserve Plan represents an important first step toward that objective.

HENRY M. JACKSON,
Chairman, Senate Committee on Interior and Insular Affairs.
HARLEY O. STAGGERS,
Chairman, House Interstate and Foreign Commerce Committee.

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I. INTRODUCTION

The Early Storage Reserve (ESR) Plan has been prepared by the Federal Energy Administration (FEA) in accordance with Section 155 of the Energy Policy and Conservation Act (the "Act"). To place that plan, which constitutes the remainder of this document, in perspective, this introductory section identifies the events leading to the creation of the ESR and summarizes the enabling legislation.

BACKGROUND

The petroleum production cutbacks, higher prices and embargo imposed during the winter of 1973-1974 provided dramatic evidence that the United States and oil consuming countries are vulnerable to interruptions in imports from the major oil-exporting nations. The embargo was characterized by: (1) a substantial reduction in oil imports, estimated at approximately 2 million barrels per day for 19 weeks, and in the various products of this oil, (2) a drastic increase in the price of imported oil; and (3) its occurrence during a period of increased demand for petroleum products.

Although the economic impacts of these events on the U.S. are still under study and debate, most of the macroeconomic study estimates of the repercussions of supply denial and simultaneous price increases tend to indicate a Gross National Product (GNP) loss of approximately $35-$45 billion. Although not all of this GNP loss can be ascribed to the embargo (perhaps $10 to $20 billion can be) there is no doubt that it contributed significantly to increases in the consumer and wholesale price indices. In addition, the GNP loss was reflected in higher unemployment and stagnation in several sectors, including automobile sales and housing starts, which exacerbated the economic downturn believed to have started in late 1973. During this period, the supply cutbacks prevented real growth that probably would have stabilized unemployment and provided a stronger base for eventual economic recovery.

It is questionable whether this exact set of circumstances will occur again, since production of exporting countries has already been substantially cut back. There is at least temporarily an excess of supply at existing prices, major new sources (North Sea, North Slope) are about to come on stream and exporters are becoming increasingly dependent on the economic prosperity in importing countries. Nevertheless, it is possible that future supply interruptions could be longer and even more severe than the 1973-1974 Arab oil embargo. Moreover, there is reason to believe that a new supply interruption would have more severe impacts on GNP and employment because the economy would be less able than it was in 1973 to adjust to a sharp drop in the supply of petroleum. Specifically, the Nation may be less able to adjust to energy shortages because higher energy prices, natural gas shortfalls, and continued uncertainty about the availability and prices of alternative forms of energy have induced many energy users to restrict their energy consumption and emphasize more effective energy management practices. As a result, many relatively easy steps to conserve energy have already been taken and significant improvements in energy efficiency have been achieved. Further improvements will require investment, long lead times, and even more intensive energy management. The program to convert oil- and gas-fired utilities and industrial plants to coal under the Energy Supply and Environmental Conservation Act of 1974 (as amended by the Act) will have converted many plants to coal, which will largely preclude conversion to coal during an embargo.

To lessen the Nation's vulnerability to petroleum supply interruptions, the development of a strategic petroleum reserve has been recommended by a number of groups, including the National Petroleum Council (NPC), Ford Foundation, the Energy Laboratory at the Massachusetts Institute of Technology (MIT), and the Research and Policy Committee of the Committee for Economic Development. In addition, such a reserve will be helpful to the United States in the context of the International Energy Program (IEP) agreement, which has been entered into by the United States and 17 other energy-importing countries.

The establishment of a strategic petroleum reserve would contribute to international stability by: (a) serving to deter future supply interruptions, since the target nations will have available a quick response capability that will increase the potential costs and reduce the benefits to the nations responsible for the shortages; (b) providing additional evidence that the United States is capable of meeting its IEP commitments without depleting its petroleum inventories; (c) avoiding the adverse economic consequences of a severe supply interruption, regardless of the cause, in the United States; and (d) avoiding undue pressures on United States foreign policy.

LEGISLATIVE DIRECTIVES

The concern voiced by these organizations and by the public, in addition to the Nation's formal commitments to the IEP, provided strong impetus for an emergency storage program. A number of bills providing for a strategic petroleum reserve were introduced in the 93rd Congress. President Ford recommended a storage program in his State of the Union message in January 1975, and Titles I and II of the Administration's Energy Independence Act provided for the creation of such a reserve. Thereafter, the Senate and the House of Representatives passed separate bills (S. 622 and H.R. 7014, respectively) requiring or authorizing creation of a strategic storage reserve, which ultimately were enacted as Title I, Part B, Sections 151 through 166, of the Energy Policy and Conservation Act (P.L. 94-163).

Briefly, the Act provides for the creation of four distinct but interrelated reserve programs:

- Strategic Petroleum Reserve (SPR)--Sections 151 and 154. To reduce the impact of disruptions in supplies of petroleum products,[1] or to carry out U.S. obligations under the IEP-the Act requires storage of at least 150 million barrels of petroleum products, including crude oil, by December 22, 1978, and authorizes the storage of up to 1 billion barrels. The Act requires FEA to develop a national plan for crude oil storage which must provide for, to the maximum extent practicable, the storage of crude oil equal to the volume of crude oil imported into the United States during the 3 consecutive highest import months in the 24 months preceding December 22, 1975, (subsequently determined to be approximately 500 million barrels, which were imported during October-December 1975), by December 22, 1982. The Act establishes interim targets of 10 percent of this goal within 18 months of enactment; 25 percent within 36 months; and 65 percent within 60 months.

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[1] Petroleum products, as defined in the legislation, means crude oil, residual fuel oil, or any refined petroleum product (including any natural gas liquid) and any natural gas liquid product. The statutory definitions are used throughout the report. (See Appendix A for a copy of the legislation.)

- Early Storage Reserve (ESR)--Sections 151 and 155. The Act further requires creation of an ESR as part of the SPR to provide limited protection from near-term disruptions in the supply of petroleum products, and to fulfill U.S. obligations to the IEP. To this end, if the SPR Plan has not become effective, the ESR must contain at least 150 million barrels of petroleum products to be stored, to the maximum extent practicable, in existing capacity by December 22, 1978. The ESR must also provide for meeting needs for residual fuel oil and refined petroleum products in regions of the country that depend on petroleum imports to fill a substantial portion of their total energy requirements.

- Industrial Petroleum Reserve (IPR)--Section 156. The Act grants the FEA discretionary authority to establish an IPR to implement the ESR or the SPR. Specifically, the Act authorizes the FEA to require importers and refiners to acquire, store, and maintain in readily available inventories amounts of petroleum equal to 3 percent of the amount imported or refined by them in the previous calendar year. According to available data that is estimated to be 185 million barrels.

- Regional Petroleum Reserve (RPR)--Section 157. The SPR Plan must provide for the establishment of an RPR in, or readily accessible to, any FEA region in which imports were used to meet more than 20 percent of residual fuel oil or refined product demand during the preceding 24 months. The quantity of petroleum product in the RPR is part of, rather than in addition to, the quantities of crude required in the SPR. Although the RPR is designed to provide substantial protection against regional supply interruption, it is not to exceed the aggregate of imports of the highest 3 consecutive months of the preceding 24-month period, computed annually. The FEA may substitute crude or product for amounts of residual fuel oil or other refined petroleum products stored in the RPR, if substitution is necessary or desirable for purposes of economy or efficiency and if there will be no delay or other adverse effect on satisfying the purposes of the RPR.

Section 153 of the Act established within FEA a Strategic Petroleum Reserve Office (SPRO). This office succeeds the Oil Storage Task Force created in the spring of 1975, and will implement the Act through the efforts of its five divisions--Storage Assessment, Management and Operations, Regulations and Coordinations, Industrial and Regional Programs, and Facility Program Management.

As a first step in fulfilling its responsibilities, the SPRO has prepared the ESR Plan for submission to Congress. In Chapter II this Plan is summarized for rapid comprehension and ready reference. The remainder of the report expands the summary, explaining in detail how the reserve will be created; what methods will be used to monitor, control, and use it; and what foreseeable impacts the creation, maintenance, and use of the ESR will have on the environment and on the economy.

II. EARLY STORAGE RESERVE SUMMARY

The objective of the ESR is to store 150 million barrels of crude oil by December 1978. This storage requirement will be incorporated into the SPR after the SPR Plan becomes effective. Thus, the 150 million barrels of the ESR is the first increment of the SPR required by the Act.

Additionally, the Act authorizes the creation of the Industrial Petroleum Reserve as part of the SPR. Under this provision, the FEA could require importers and refiners to acquire, store, and maintain petroleum reserves. However, no decision on whether or not to implement the IPR has been made. A thorough analysis is being conducted and the views of industry, consumers, and others on this issue will be solicited. The maximum IPR amount authorized by the Act is three percent of the amount imported or refined in the previous year, which would currently amount to approximately 185 million barrels.

Further, the Act requires that the ESR shall provide for meeting residual fuel and refined product needs in any region that the FEA Administrator determines is or is likely to become dependent on imports for a substantial portion of its total energy requirements. FEA interprets this mandate to be substantially similar to the RPR portion of the SPR, which requires that product or crude be stored in, or readily accessible to, the particular regions affected. The analysis on regional storage is in process, and a determination will be made by December 1976 as to whether crude or product will be stored in the RPR, and whether it will be in or readily accessible to the affected regions.

The ESR has been designed to meet to the extent practicable all stipulated and implied storage requirements within the deadlines specified in the Act. (See Figure II-1.) As noted below, this will require a significant implementation effort. To demonstrate the feasibility of such a plan, the remainder of this chapter summarizes current plans on: (1) how the ESR will be developed; (2) how it will be managed under normal conditions and in the case of an energy supply interruption; and (3) what the environmental and economic impacts of the ESR are likely to be.

DEVELOPMENT OF RESERVE

Development of the reserve involves answering a number of questions and resolving several issues concerning the petroleum products to be stored and the physical facilities in which they will be maintained.

Petroleum Products for Storage

The questions to be answered for storage products include how much and what kind of petroleum (i.e., crude oil and refined products) should be stored, and the way in which those quantitites should be acquired, including the rate at which they will have to be acquired to meet the mandated deadlines.

The ESR must be capable of supplying different types of crude in quantities required to meet various market demands. The types of crude selected for storage will be compatible with the crude requirements of those refineries that are likely to be cut off during a supply interruption i.e., the crude will conform to the refineries' processing capabilities in terms of its characteristics (e.g., molecular composition, wax and asphalting content and API gravity).

On this basis, nine possible crude oil segregation categories were identified, using crude oil sulfur content and API gravity as the important defining characteristics. (Residual metals content will be included at a later date). With this preliminary classification scheme, the amount of each type of crude which may be stored in the ESR was calculated; the results are displayed in Table II-1. This is a target mix; precise combinations of crude will be decided subsequently as determined by considerations of cost and the needs of the refineries for which crude is stored.

Table II-1

ESR Storage Volumes by Type of Crude

Segregation Category		Target Mix	ESR
Sulfur Wt.%	API °	(Percent)	(MMB)
0.01-0.50	43 - 47	6.6	9.9
0.01-0.50	38 - 40	8.2	12.3
0.51-1.00	38 - 40	1.9	2.8
1.01-1.80	38 - 40	1.5	2.2
0.01-0.50	33 - 37	16.6	24.9
1.01-1.80	33 - 37	35.8	53.7
0.01-0.50	29 - 32	2.7	4.1
0.51-1.00	29 - 32	3.9	5.9
1.01-1.80	29 - 32	22.4	33.7
TOTALS		100.0	150.0

The FEA plans to acquire the petroleum products for the ESR from crude oil obtained through purchase on the open market, at a price equivalent to the national average price.

The President has submitted a budget request for FY 1976 and FY 1977 to implement the ESR. To meet the storage objective, purchase and construction of all ESR storage facilities must occur in late FY 1976 and early FY 1977. To meet the total storage objective of the SPR, new construction of SPR facilities should be initiated in early FY 1978. Consequently, FEA has requested obligation authority of $300 million in FY 1976 for the construction of all facilities for the ESR and $550 million in FY 1977 for the purchase of 50 million barrels of oil (See Table II-3).

To meet the 1978 deadline stipulated in the Act, FEA has planned a stringent storage schedule, as shown in Table II-2.[1] FEA plans to begin filling the storage facilities early in 1977 and to have 150 million barrels stored by the end of 1978. However, the actual timing of purchases is contingent upon whether the storage facilities will be ready and the availability of funds.

The proposed schedule is further predicated on the assumption that the requirements of the National Environmental Policy Act (NEPA) can be satisfied without procedural delays and that all necessary State, local and Federal permits can be obtained on schedule. Presently, programmatic and multiple site specific environmental impact statements are being prepared, with initial drafts scheduled for relase during May of this year. Identification of permit requirements is also proceeding and a schedule of filings will be prepared.

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[1] It is infeasible to acquire and fill 50 million barrels of economical storage facilities, the 18-month target for the Strategic Petroleum Reserve, by June 1977. Little existing capacity is available, and leasing costs would be excessive compared with conversion of salt domes. Conversion and filling of 50 million barrels capacity cannot be completed by June 1977.

To commence filling the reserve in early 1977, it will be necessary to initiate purchases for oil in early FY 1977 and to continue purchasing oil until the SPR is complete.

Table II-2

ESR Storage Schedule

Time Period	Volumes to Enter Storage (Millions of barrels) Incremental	Cumulative
January - December 1977	60	60
January - December 1978	90	150

Storage Facilities

In compliance with the Act, FEA will, to the maximum extent practicable, use existing storage capacity for the ESR, and this will be incorporated into the SPR after the SPR Plan is approved. The major storage facility options available are salt domes, mines, and tanks. Given the 3-year timeframe of the ESR, existing and convertible mines and salt dome caverns will be the principal storage facilities for the ESR. However, if sufficient existing capacity is not attainable, newly constructed salt dome caverns, using a "fill while leaching" technique, will be used. Initial assessments indicate that tank storage will not be needed.

At present, it is estimated that existing salt caverns[1] have a capacity in excess of 200 million barrels, 127 million barrels of which could be converted and filled by December 1978. Existing underground mines[2] have an estimated capacity of 170 million barrels, of which 75 million barrels could be converted and filled within the next three years.

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[1] Caverns/cavities throughout this report refer to storage volumes created by solution mining techniques. The existing caverns/cavities must be connected to petroleum pipelines before they can serve as storage facilities.

[2] Mines throughout this report refer to storage volumes created through conventional dry-mining techniques.

To comply with the directives of the Act--to use existing facilities to meet the 3-year ESR requirement for 150 million barrels--and to incorporate ESR sites into the SPR, as well as to realize the usual economies of scale, the FEA will acquire for the ESR facilities with an ultimate capacity of 200 to 300 million barrels.[1] A mine or cavern used to store ESR requirements can then satisfy at least part of the SPR requirements by filling the cavities to their full converted capacity.

Although specific sites have not as yet been selected, optimum general locations have been identified. They are: (1) salt domes in the Gulf Coast; and (2) mines located in the South and Midwest. Specific sites will be chosen on the basis of:

- o Short-term (i.e., 3-year) and ultimate capacity
- o Accessibility to distribution system
- o Freedom from technical restrictions
- o Extent of environmental impacts
- o Feasibility of acquisition
- o Costs.

Priority will be placed on sites that would (1) minimize the cost of the reserve, (2) be able to efficiently deliver oil at rates required to refiners and users of imports during an oil interruption, (3) be included in the final Strategic Petroleum Reserve because of their desirable location and cost, and (4) have the potential for being filled, at least in part, in three years.

Facilities for the ESR will be acquired primarily through site-by-site negotiation. Design and engineering work and early procurement of strategic materials will begin soon.

MANAGEMENT OF THE ESR

The ESR will be managed through an interconnected system of controls, regulations, and withdrawal and allocation procedures.

To ensure the integrity of the purchase, transport, storage, and distribution of crude oil and refined products in the ESR, FEA will establish and maintain financial audit controls, purchasing and receiving controls, site security and storage monitoring, an independent inspection and auditing system, and withdrawal controls. In addition, FEA will issue and enforce regulations regarding the method of drawdown and the way in which the petroleum would be allocated in the event of a supply disruption.[1]

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[1] Lead-time considerations limit the possible amount of actual fill within the 3-year timeframe to slightly in excess of 150 million barrels even though the final capacity is greater.

The rate at which crude oil will be withdrawn, and distributed, will vary with the nature of the supply interruption and the size of the reserve. It will be based on the amount of petroleum in the reserve and the estimated length of time it must last (i.e., the projected length of the supply interruption), the estimated size of the supply shortfall in relation to U.S. consumption, and the implementation of other contingency plans, including the Energy Conservation Contingency Plan or the Rationing Contingency Plan.[2]

The storage facilities and all related facilities, which include pipelines, surge tanks, terminal facilities, and associated port facilities, will be integrated with existing crude oil distribution systems and will be adequate to meet fill and disbursal rates. During a severe shortage, petroleum will be transported to those areas requiring supplies, using the existing transportation facilities. Tankers and barges could be used to transport crude oil to the East Coast, Caribbean, and Gulf of Mexico refineries. In the event of severe interruption, idle foreign flag ships might be used, although this would require a waiver of the Jones Act provision which generally precludes the use of foreign flag ships for transportation from one U.S. port to another.

IMPACTS OF THE ESR

Development and use of the ESR may have a number of important environmental and economic impacts. The FEA is conducting comprehensive environmental studies now to determine the environmental impacts from the ESR. A draft programmatic environmental impact statement will be made available to the public in May 1976.

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[1] The authority to activate the drawdown of the ESR, however, rests with the President. Such an order would be based on recognition of a severe petroleum supply interruption or an obligation of the United States under the International Energy Program.

[2] Pursuant to Section 201 of the Act, these contingency plans are being developed and will be submitted to Congress by the President in June 1976.

In addition to the programmatic environmental impact statement, FEA is preparing environmental impact statements on potential sites under study. Results of these site-specific studies will be used both in site selection and, subsequently, in facilities design.

The impacts of creating the ESR on the nation's GNP, employment and inflation are projected to be negligible. Further, it is the FEA's assessment that the crude oil purchase schedule (see Table II-2) will not materially affect world petroleum markets. However, the ESR will result in the transfer of approximately $2 billion additional to foreign countries by December 1978.

Figure II-1
EARLY STORAGE RESERVE
Major Milestone

						1976								1977			1978	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1st Qt	2nd Qt	3rd Qt	4th Qt	1st half	2nd half
REPORTS																		
Early Storage Reserve Plan	----	draft	-----	final														
Strategic Petroleum Reserve Plan	----	begin	---	---	---	---	---	---	draft	---	---	final						
FEASIBILITY STUDIES																		
Salt Domes	---	---	---	---	final													
Mines	---	---	---	---	interim	---	final											
Tanks	---	---	interim	---	final													
Control Systems	-----	final																
Industry Storage	---	---	---	---	---	---	draft	---	final									
Detailed Design				begin	---	---	---	---	---	---	---	---	---	---	---	---	---	---
ENVIRONMENTAL IMPACT STUDIES																		
Programmatic	---	---	---	draft	---	---	---	EIS										
Salt Domes	begin	---	---	draft	---	---	---	EIS										
Mines	begin	---	---	draft	---	---	---	EIS										
Tanks[1]	---	---	begin	---	---	draft	---	---	---	EIS								
PROCUREMENT																		
Existing Sites	plan	---	---	---	---	negotiations	---	---	---	---	---	complete						
Oil		plan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	complete	
CONSTRUCTION/CONVERSION									begin	---	---	---	---	---	---	---	---	---
REGULATIONS																		
Industry Storage[1]				inquiry	---	---	---	---	propose regulations if appropriate	---	---	---	issue final if appropriate					
FILL																		
Domes/Mines/Tanks													begin	---	---	50 mmbbl	---	150 mmbbl

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[1] Schedule for Planning Purposes only.

Table II-3

STRATEGIC PETROLEUM RESERVE FEDERAL BUDGET OBLIGATIONS

	FY 76	TQ	FY 77
Petroleum Products and Facilities			
° Fed. Gov't. Open Market Purchase (MMb)	-		50
° Government Oil Purchases	-		550,000
° Facility Design/Purchase Construction	300,000		-
Planning/Operations/Personnel ($000)	13,566	600	7,684
TOTAL ($000)	313,566	600	557,684

III. DEVELOPING THE RESERVE: PETROLEUM PRODUCTS

The purpose of the ESR is to develop quickly (over a 3-year period) at least a 150-million-barrel reserve of petroleum products to provide short-term protection against a possible supply interruption. In the case of a severe interruption, the ESR would cushion the adjustment of the economy to lower levels of petroleum supplies while minimizing the immediate extent of any potential loss in GNP. The establishment of the ESR should also help to discourage oil-exporting countries from initiating an embargo.

Given these important benefits, the FEA is moving ahead quickly in developing the reserve. This development involves the establishment of quantitative answers to a number of questions about the types and quantities of refined products and crude oil needed, and the way in which those quantities can be acquired. Moreover, since the development of the ESR must be consistent with the development of the longer term SPR, particular care has been taken to evaluate the extent to which such consistency exists.

QUANTITIES AND TYPES REQUIRED

As specified in the Act, the ESR will contain not less than 150 million barrels of petroleum products by the end of 1978. Although the legislation does not stipulate the amount or portions of this total that must be crude and refined products, it does indicate that regional needs for residual fuel oil and refined products must be provided for in those areas that, in FEA's judgment, depend heavily on imported oil or refined products or are likely to become dependent on imports for a substantial portion of their total energy requirements. Any refined products stored are to be a part of, rather than an addition to, the total size of the ESR.

For the SPR, the Act stipulates a minimum quantity which must be in storage by December 1982 unless FEA proposes, and the Congress accepts, a modified quantity. This minimum storage must equal the amount of crude oil imported into the United States during the 3 consecutive months of the 24-month period preceding December 1975[1] in which average monthly imports were the highest. A general maximum of 1 billion barrels is also authorized in the Act. Given the 3-month peak level of imports that occurred in October-December 1975, the minimum requirement will be approximately 500 million barrels. (See Figure III-1).

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[1] The date of the enactment of the Act.

In addition to setting target and maximum requirements for the reserves, the Act provides a mechanism for allowing FEA to recommend changes in the specified volumes and target dates. FEA may develop such a recommendation, based on a detailed cost/benefit analysis and other relevant factors for inclusion in the SPR plan to be submitted to Congress by December 15, 1976.

Although the Act does not stipulate the amount or percentage of the total petroleum storage requirement that must be crude oil or refined product, both the ESR and the SPR are to provide a combination of refined products and crude that would be responsive to market needs during a supply interruption.[1] The relative quantities and types of refined products and crude oil that should be stored at any time are a function of: (a) the quantity and types of refined product and crude oil being imported from potentially interruptible sources; (b) relative dependency of various regions on those imports; (c) available refinery capacity and yield flexibility here and abroad; (d) potential demand restraints; (e) capabilities of the petroleum distribution system; and (f) relative acquisition costs.

All evidence indicates that historical trade patterns are poor indications of trade patterns during a major supply interruption. However, in attempting to determine how much product and crude must be stored, the FEA disaggregated the U.S. petroleum market into regional markets. For refined products, historical and projected consumption were examined in all FEA Administrative Regions. (See Figure III-2 for a list of these regions.) Because marketing patterns of crude oil are different from those of products, 14 crude markets, based on major refinery groupings and shared access to similar distribution facilities, were identified to study historic and projected crude oil consumption. (See Figure III-3, for a list of the crude oil markets, and Figure III-4, for a map of these markets.)

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[1] The components of the marketplace--refineries and petroleum product consumers--would be affected by any embargo to different extents, according to their degree of dependence on interrupted petroleum. Moreover, refineries and petroleum-product consumers are capable of responding to petroleum shortfalls to different extents. For example, refineries can alter their capacity utilization rates and yields, subject to costs and technical limitations. Consumers can change their consumption patterns to achieve conservation.

Refined Products

The Act requires that "the ESR shall provide for meeting regional needs for residual fuel oil and refined petroleum products in any region which the Administrator determines is, or is likely to become, dependent upon imports of such oil or products for a substantial portion of the total energy requirements of such region." In planning the most effective and economical means of providing for these needs, FEA has identified preliminary guidelines relating to quantities, locations, and substitution of crude for products:

1. The RPR is not to exceed the imports of qualifying products in the highest 3 consecutive months out of 24 months preceding an annual recomputation for each region. FEA has prorated this maximum for the ESR as 30 percent of the RPR maximum for the SPR.

2. A portion of the reserve is to be established in, or be readily accessible to, each FEA region with imports of refined or residual petroleum products in excess of 20 percent of the demand for these products.[1]

3. The reserve is to contain sufficient amounts of refined products or substitute crude, as provided in the Act, to protect the regions against an interruption or reduction in residual-oil or refined-product supplies.

---

[1] FEA considers it a general requirement of the program that reasonable assurance be provided for the availability of any imported products that may constitute less than 20 percent of consumption.

4. Crude oil, residual fuel oil, or any refined petroleum product may be substituted for all or part of the residual fuel oil or refined petroleum product required for any region, if such substitution is necessary or desirable for purposes of economy, efficiency, or other reasons, and if such substitution can be made without delaying or otherwise adversely affecting fulfilling RPR requirements.

To determine which FEA regions depended on imports for 20 percent or more of their total demand, 1973 and 1974 consumption data were collected from the Bureau of Mines' (BOM) Fuel Oil Sales Annual, and import data were obtained from the U.S. Department of the Interior's (DOI) oil and gas imports data base and the BOM's Annual Petroleum Statement.[1] To establish regional-import levels, DOI regional import proportions were applied to BOM data because BOM data are unavailable on a regional basis. RPR requirements were then calculated by comparing these import figures with consumption data from BOM's Sales of Fuel Oils and Kerosine.[2] (See Figure III-5.)

From this comparison it has been determined that product imports in 1973-1974 exceeded 20 percent of regional demand for distillate fuel oil in FEA Regions 1 and 2 and for residual fuel oil in FEA Regions 1, 2, 3, and 4. (See Figure III-6.) Current FEA Project Independence Evaluation System (PIES) forecasts indicate an RPR will probably not be required in future years for some of the presently qualifying regions and products because residual oil and distillate imports into Region 1 through 4 are projected to decrease from an average daily rate of 1.6 million barrels in 1973-1974 to 1.3 million barrels in 1980 and 500,000 barrels in 1985. (See Figure III-7 for PIES regional product forecasts for FEA Regions 1-4 in 1980 and 1985.)[3]

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[1] Two sources of import statistics were used because irreconcilable differences were discovered when the two sets of data were compared.

[2] Sales of Fuel Oils and Kerosine, Bureau of Mines, 1974.

[3] The PIES regional product forecasts assumed no transportation constraints between regions, particularly on the West Coast and from Alaska eastward to the central United States.

To determine the advisability of substituting crude oil, residual fuel oil, or any refined petroleum product for all or part of the residual fuel oil or refined petroleum product required for any region, the FEA has initiated a comprehensive study of site availability, costs,[1] refinery capacities and yield flexibility, transportation, and distribution alternatives. Early results indicate it may be possible to substitute crude completely for product in the RPR; however, because the analyses are incomplete, these early conclusions may be invalid.[2] Moreover, preliminary findings indicate there are only two viable means of storage for the RPR: aboveground storage primarily in steel tanks located in the affected FEA regions, and underground (i.e., caverns, mines) storage in the Gulf of Mexico. The startup time for development of steel tanks is very rapid--about one year. On the other hand, since the bulk of the SPR crude will be stored in salt domes in the Gulf, and since work has already begun to develop these storage facilities, it would be relatively simple to include storage of RPR substitution crude in these plans at a later date.

Because the analyses have not been completed and no final conclusions on the advisability of crude substitution for product have been reached, the final decision on the RPR substitution issue has been deferred until the SPR plan is prepared and submitted to Congress in December 1976.

This period will allow the FEA sufficient time to analyze the myriad details that affect the feasibility of a total substitution of crude for product in the RPR. Moreover, because of the relatively rapid start-up potential inherent in above-ground storage, any program risks associated with deferring final decision until the December 1976 SPR report to Congress would be minimal. Plans for underground storage of crude oil in the Gulf of Mexico area must proceed whether or not crude is substituted for product.

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[1] The storage of residual oil would require heated tanks for above-ground storage or an underground heating system for below-ground storage. This requirement makes the cost of storing residual oil 5-15 times higher than the cost of storing crude oil in salt domes. As an alternative, No. 4 oil could be stored in salt domes or distillate could be blended with residual oil, but the Btu value of distillate is about 7 percent less than residual, and its price (in November 1975) was about 18 percent higher per barrel.

[2] Final analytical results will be presented in the December 1976 SPR report to Congress.

Thus, the FEA has, for ESR planning and budgeting purposes, included in this report requirements for storage of crude oil only in the Gulf of Mexico area. Any changes in this approach will be incorporated in the SPR plan.

Crude Oil

Although the final decision on crude substitution has been deferred until December 1976, for planning purposes the FEA has assumed the ESR will consist of 150 million barrels of crude oil. However, crude oil is not a homogenous commodity, with some characteristics such as sulfur content and gravity[1] varying significantly. For example, crude from Algeria tends to have a high API gravity[2] and few impurities such as sulfur. In contrast, Saudi Arabian crudes tend to be heavy (i.e., a low API gravity) and have a high sulfur content.

Gravity and sulfur content have marked effects on refinery processing equipment and product yields.[3] Specifically, refineries that process crude oils with high sulfur content require expensive desulfurization equipment. In addition, crude oil with high API gravities tend to yield greater amounts of light ends, such as light naphtha and diesel fuel, than heavy crudes. For example, a Texas Gulf Coast heavy crude will yield 5 percent by volume light naphtha and 12 percent by volume heavy fuel oil. On the other hand, Texas Gulf Coast light crude will yield 13 percent by volume light naptha and only 1 percent by volume heavy fuel oil.[1] Because of these differences in crude and their potential impacts on end products, the 150-million-barrel ESR and 500-million-barrel SPR[2] crude requirements were broken down by assay characteristics.[3]

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[1] Analysis of other crude characteristics, such as residual metals content, will be included in a study at a later date.

[2] Gravity is measured in American Petroleum Institute (API) degrees; the higher the API degree, the lighter the crude oil. Sulfur content is measured by weight percent; the higher the weight percent, the higher the sulfur content.

[3] Although sulfur content is of some significance--e.g., highly corrosive feedstocks can be limited to refineries with this processing capability--moderate corrosion has been encountered with some crudes containing as little as 0.2 percent sulfur, while some higher sulfur crudes (0.4 to 0.9 percent) cause only mild corrosion. Hence, a more selective measure may be needed.

The amount of each type of crude to be stored depends on its compatability with processing equipment at refineries at which import shortfalls would be expected to occur, and with product mix objectives. For the purpose of preliminary planning of crude oil purchases, a crude oil classification system, based on API gravity and sulfur-weight percent, has been developed.[4] In this system, there are 8 sulfur and 12 gravity categories. (See Figure III-8.) Again, for the purposes of preliminary planning only and given time constraints in preparing this report, the total amount of non-Western Hemisphere crude oil imported during 1974 i.e., an average of 2.06 million barrels per day - was distributed throughout the matrix on the basis of sulfur content and API gravity,[5] and percentages of total were calculated. (See Figure III-9.) The effects of a possible interruption of Western Hemisphere imports will be examined in the future.

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[1] The difference in yields can be even more striking, as is the case with Latin American crudes from Leona and Oficina. Oficina crude has a gravity of 36.3 API and a yield by volume of 32.5 percent and 11.1 percent for residual and asphalt, respectively. Leona crude, at 25.1 API, yields 54.5 percent and 33 percent, respectively, of residual and asphalt.

[2] Pending resolution of the RPR crude substitution option.

[3] Using only sulfur content and API gravity to determine the quantities of crude types to be stored may not be sufficient, and other characteristics (e.g., viscosity, pour point) may be included at a later date.

[4] The FEA is in the process of performing an analysis of residual metals, including nickel and vanadium. The results of this analysis will be integrated into the gravity/sulfur weight classification scheme.

[5] These quantities by type should be interpreted as "acceptable to" rather than "needed by" refiners at that time. The extent to which price influences a buy decision has not been determined. Crude quantities by type, based on actual refinery need, is the subject of continuing FEA study.

Assuming these percentages of total will remain relatively constant, the target amounts of each type of crude required for the ESR (See Figure III-10.) and the SPR (See Figure III-11.) were calculated. The necessary level of each type of crude could be achieved either by placing that type of crude in storage or by blending at individual refineries. However, amounts of each type of crude actually purchased and stored could differ from these targets because of crude oil availability and/or price, limitations in site design, refinery adaptability to varying crude types, changes in domestic refinery yield desired during an emergency, or changes in the composition of imports of non-Western Hemisphere crude over time.

The impact of each of these factors on the composition of the ESR and the SPR is currently being analyzed. However, initial findings indicate that the amount of crude oil actually stored will be severely constrained by site design considerations. As a result, the ESR and the SPR will probably contain only 4-10 grades of crude oil.

The quantity of each crude type for the ESR and the SPR (see Figures III-10 and III-11.) was based on the amount of non-Western Hemisphere crude oil imported into the U.S. and the Caribbean during 1974 and, consequently, includes a significant amount of high-sulfur crude that was refined in Caribbean refineries. However, United States refineries, in general, cannot process crudes with the higher sulfur levels to the same extent as Caribbean refineries. Therefore, the amounts of high-sulfur crudes were shifted toward the lower-sulfur-weight categories by a weighting scheme that reflected U.S. refining capabilities.[1]

In addition, the number of crude types originally identified and calculated was excessive and had to be reduced for further analysis. To this end, the various categories of crude were clustered to determine where the greatest demand, by type, existed. This clustering and the redistribution of high-sulfur crudes resulted in nine crude categories composed of the ESR and the SPR quantities shown in Figure III-12. Analyses indicate that future crude oil imports will tend to be higher in sulfur content and have lower API.[1] This contingency will be accommodated in two ways. First, the composition of non-Western Hemisphere crude imports will be continually monitored; as the composition changes, the types of crudes acquired will change. Second, refineries can typically process lower-sulfur-content crudes than they are currently using. Therefore, even if interrupted crudes were to have higher-sulfur-content than those in the reserve, it is anticipated that the reserve petroleum could be used without loss of product yield.

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[1] U.S. Domestic Petroleum Refining Industry's Capability to Process Sweet/Sour Crude Oil, National Petroleum Refiners Association, May 17, 1973.

ACQUISITION

In addition to specifying the types and quantities of petroleum products to be included in the ESR, it is important to identify how this oil will be acquired. The following sections describe how the acquisition will be financed, how much it will cost, where it will be obtained, and at what rate it will be acquired.

Financing

The Act authorizes FEA to acquire petroleum products in a manner consistent with the following objectives:

1. Minimization of the cost of the reserve
2. Orderly development of the NPRs to the extent authorized by law
3. Minimization of the nation's vulnerability to a severe energy supply interruption
4. Minimization of the impact of such acquisition on supply levels and market forces
5. Encouragement of competition in the domestic petroleum industry

The Act authorizes the FEA Administrator to require refiners and importers to provide an Industrial Petroleum Reserve (IPR) of up to 3 percent of the amount refined or imported (refinery throughput or imports) in the previous year. Although this option is under study, a final decision cannot be made on the advisability of exercising this authority until further information is gathered and analyzed.

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[1] Based on marginal world supply, the U.S. can expect to import more crude from Saudi Arabia since it has the largest reserves. This crude is primarily high in sulfur content and low in API°.

FEA initated a major study in December 1975 to determine what would be involved in implementing an IPR and what regulations should be established. The options for implementation range from requiring every importer and refiner to stockpile the required quantities in storage facilities of his own choosing in close proximity to his distribution system, to having the government provide large, central storage locations such as salt domes and allowing industry to rent these government-provided storage facilities to store IPR oil. Between these extremes are many combination options--e.g., consortia and third parties providing storage facilities. Each option would have significantly different regulatory requirements, environmental and antitrust implications, monitoring and enforcement requirements, and cost to industry and to the consumer. Thus, the costs and benefits of the IPR may be different for each option.

The study will also assess the effect of regulations on economic viability and competitiveness within the petroleum industry. At the conclusion of this study, the FEA will adopt a position on the advisability of an Industrial Petroleum Reserve, propose the necessary implementing regulations if the IPR is advisable, and make appropriate recommendations in the December 1976 SPR report to Congress.

To finance the government portion of the ESR, the Act authorizes: (1) use or exchange of government royalty oil; (2) the purchase or exchange of domestic or foreign petroleum products; or (3) the use or exchange of NPR oil to the extent authorized in the recently enacted P.L. 94-258. Pending a decision on requiring an IPR, the FEA plans to purchase 50 million barrels of crude oil (or products, depending on the final crude-substitution decision) in FY 1977 and 100 million barrels in FY 1978. Funding will be requested to support purchase at the national average price, and acquisition of petroleum for the ESR will have to be consistent with the legal requirements of the Emergency Petroleum Allocation Act of 1973, as amended.

The government has another possible financing option. Under P.L. 94-258, the NPRs could produce enough petroleum to meet ESR and SPR requirements. To the extent allowed by existing market conditions, and applicable law, such amounts could be sold or exchanged in West Coast markets rather than shipped to storage sites, since the transportation of NPR production from Elk Hills, California, to the Gulf Coast, Midwest, or East Coast storage sites would cost an estimated $0.75 to $1.00 per barrel. The sale of NPR production would become a source of federal funds to support appropriations to FEA for the purchase of oil. As an alternative, the Administrator could exchange NPR oil directly for oil of the specifications required that is located closer to the storage sites and therefore is more economical than NPR oil. Present planning is to consider the NPRs as a source of federal funds; it is not intended to exchange NPR oil directly for oil to be stored.

Cost

Funds are being requested to purchase the initial 50 million barrels of oil in FY-1977. A planning figure of $11 per barrel is being used as an estimate of the national average price; the $11 per barrel assumption results in a budgetary requirement of $550 million.

Sources

Since foreign crude is the marginal source of new crude supplies, and since it is a foreign crude interruption we are protecting against, it will undoubtedly be the actual physical source of crude stored in the reserve. Although some have speculated that foreign producers might consider purchases of oil for storage purposes to be detrimental to their national interests, the U.S.'s intention to create a strategic petroleum reserve is a matter of public record, and no problem is anticipated. However, the exact countries from which crude oil will be purchased will be determined as crude oil procurement plans are developed.

Rate

The rate of acquisition of crude oil is potentially limited by two factors: the rate of acquisition of storage facilities and the availability of appropriations. Crude oil will be purchased and scheduled for delivery to facilities ready to begin fill. The fill schedule shown in Figure III-13 is based on the ESR and the SPR legislative requirements of 150 million and 500 million barrels, respectively, and this schedule represents FEA's current target. Appropriations are assumed to be available for the purchase of oil when the facilities are ready to begin fill.[1]

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[1] Section 166 of the Act does not authorize funds for the purchase of oil for the SPR beyond the first 150 million barrels for the ESR. Under the Act additional authorization occurs when the SPR Plan is approved,

Figure III-1

CRUDE IMPORTS 1974-1975

	MB/CD						
	USA[1]	PR[2]	VI[3]	Guam[4]	Total	MMB	
Jan 74	2,382	190	610	28	3,210	99.5	
Feb	2,248	190	398	28	2,864	80.2	
Mar	2,462	190	458	28	3,138	97.3	
Apr	3,267	190	381	28	3,866	116.0	
May	3,748	183	277	28	4,236	131.3	
Jun	3,957	239	561	28	4,785	143.6	
Jly	4,167	227	619	28	5,041	156.3	
Aug	3,852	211	354	28	4,445	137.8	
Sep	3,758	193	593	28	4,572	137.2	
Oct	3,936	190	344	28	4,498	139.4	
Nov	3,997	140	402	28	4,567	137.0	
Dec	3,979	159	854	28	5,020	155.6	
Jan 75	3,964	212	740	28	4,944	153.3	
Feb	4,061	228	429	28	4,746	132.9	
Mar	3,853	195	446	28	4,522	140.2	
Apr	3,416	221	467	28	4,132	124.0	
May	3,493	171	346	28	4,038	125.2	
Jun	3,907	185	311	28	4,431	132.9	
Jly	4,337	204	690	28	5,259	163.0	
Aug	4,661	178	689	28	5,556	172.2	
Sep	4,664	206	270	28	5,168	155.0	
Oct	4,416	170	807	28	5,421	168.1[5]	493.2
Nov	4,634	171	489	28	5,322	159.7[5]	
Dec	4,496	220	590	28	5,334	165.4[5]	

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[1] Source: Monthly Energy Review December 1975 for data shown from January 1974 - December 1975.

[2] Source: FEA Weekly and Monthly Petroleum Reporting System (WPRS and MPRS) for data shown from May 1974 - November 1975. FEA estimate for data shown for December 1975. Oil and Gas Import estimates for data shown for January 1974 - April 1974.

[3] Source: Census Bureau, Summary of U. S. Export and Import Merchandise Trade for data shown from January 1974 - November 1975. FEA estimate for data shown for December 1975.

[4] Source: FEA Entitlements Office.

[5] Three highest consecutive months of crude imports. Total is 493.2 million barrels.

Figure III-2

FEA ADMINISTRATIVE REGIONS

Region 1 - Maine
New Hampshire
Vermont
Massachusetts
Connecticut
Rhode Island

Region 2 - New York
New Jersey
Puerto Rico
Virgin Islands

Region 3 - Pennsylvania
Maryland
West Virginia
Virginia
District of Columbia
Delaware

Region 4 - Kentucky
Tennessee
North Carolina
South Carolina
Mississippi
Alabama
Georgia
Florida
Canal Zone

Region 5 - Minnesota
Wisconsin
Michigan
Illinois
Indiana
Ohio

Region 6 - Texas
New Mexico
Oklahoma
Arkansas
Louisiana

Region 7 - Kansas
Missouri
Iowa
Nebraska

Region 8 - Montana
North Dakota
South Dakota
Wyoming
Utah
Colorado

Region 9 - California
Nevada
Arizona
Hawaii
Pacific Trust Territory
American Samoa
Guam

Region 10 - Washington
Oregon
Idaho
Alaska

Figure III-3

FEA CRUDE OIL MARKETS

Market 1: Northeast

Massachusetts
Maine
New Hampshire
Vermont
Connecticut
Rhode Island

Market 2: Atlantic

Eastern New York
New Jersey
Eastern Pennsylvania
Maryland
Virginia
District of Columbia
Delaware
North Carolina
South Carolina
Georgia
Florida
Alabama

Market 3: Northern Inland

Western New York
Western Pennsylvania
West Virginia

Market 4: Southern Inland

Kentucky
Tennessee
Inland Mississippi

Market 5: Caribbean

Puerto Rico
Virgin Islands
Canal Zone

Market 6: St. James

Mississippi Gulf
East Louisiana Gulf

Market 7: Port Neches

Western Louisiana Gulf
Eastern Texas Gulf

Market 8: Freeport

West Texas Gulf

Market 9: Central

Inland Louisiana
Inland Texas
Arkansas
Oklahoma
Missouri
Kansas
Illinois
Indiana
Ohio
Michigan

Market 10: Northern

Wisconsin
Minnesota
North Dakota
Montana

Market 11: Rocky Mountain

Iowa
Nebraska
South Dakota
Wyoming
Colorado
Utah

Market 12: Inland Western

New Mexico
Arizona
Nevada
Idaho

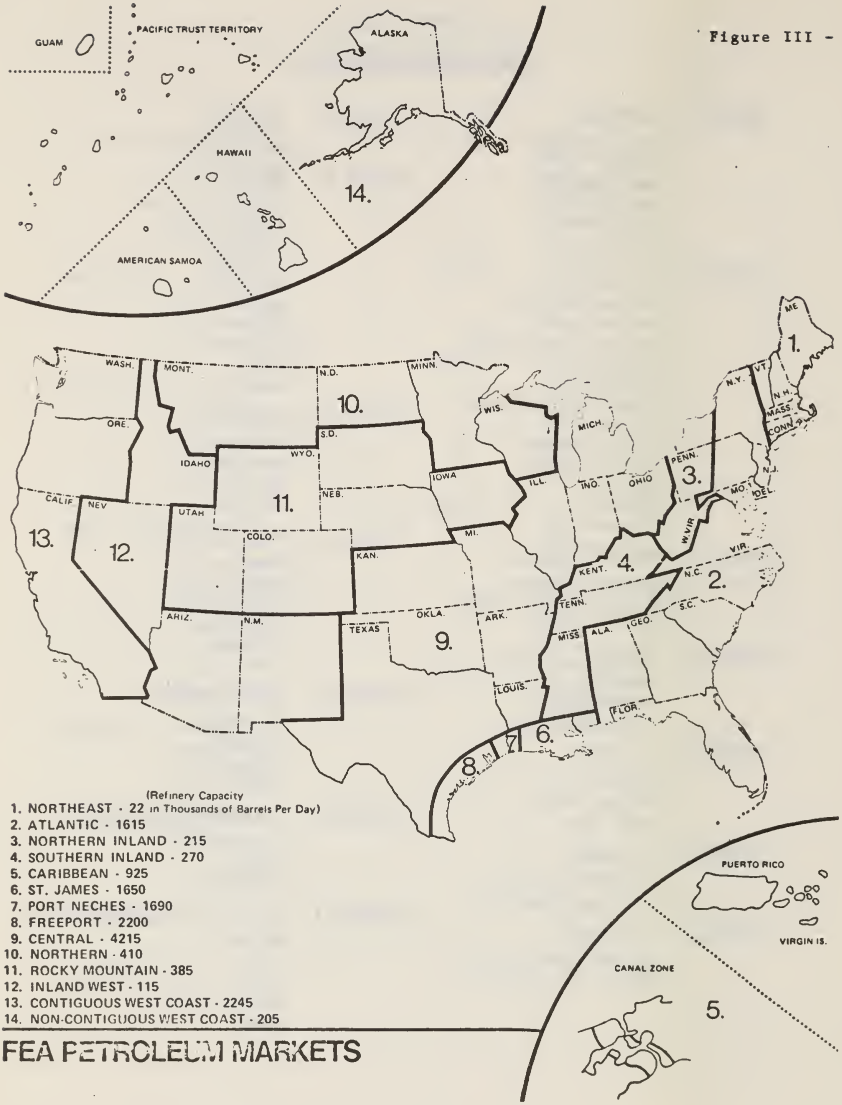
Market 13: Contiguous West Coast

California
Oregon
Washington

Market 14: Non-Contiguous West Coast

Alaska
Hawaii
Pacific Trust Territory
American Samoa
Guam

Figure III - 4



(Refinery Capacity in Thousands of Barrels Per Day)

1. NORTHEAST - 22
2. ATLANTIC - 1615
3. NORTHERN INLAND - 215
4. SOUTHERN INLAND - 270
5. CARIBBEAN - 925
6. ST. JAMES - 1650
7. PORT NECHES - 1690
8. FREEPORT - 2200
9. CENTRAL - 4215
10. NORTHERN - 410
11. ROCKY MOUNTAIN - 385
12. INLAND WEST - 115
13. CONTIGUOUS WEST COAST - 2245
14. NON-CONTIGUOUS WEST COAST - 205

FEA PETROLEUM MARKETS

Figure III-5

DEMAND AND IMPORTS OF MAJOR PRODUCTS BY FEA REGION

JANUARY 1973 - DECEMBER 1974 (MB/CD)

FEA REGION	MOTOR GASOLINE			KEROSINE			DISTILLATE FUEL OIL			RESIDUAL FUEL OIL		
	DEMAND[1]	IMPORTS[2]	%	DEMAND[3]	IMPORTS[2]	%	DEMAND[3]	IMPORTS[2]	%	DEMAND[3]	IMPORTS[2]	%
1	311	29	9.3	11	0	0.0	323	98	30.3	409	291	71.1
2	566	34	6.0	19	1	5.3	506	105	20.8	638	496	77.7
3	671	10	1.5	23	0	0.0	363	23	6.3	457	308	67.4
4	1,171	1	0.1	52	0	0.0	357	8	2.2	365	303	83.0
5	1,416	0	0.0	37	0	0.0	627	2	0.3	207	16	7.7
6	808	9	1.1	37	1	2.7	299	20	6.7	185	13	7.0
7	429	0	0.0	4	0	0.0	145	0	0.0	19	0	0.0
8	235	1	0.4	4	0	0.0	106	0	0.0	32	0	0.0
9	756	1	0.1	5	0	0.0	172	2	1.2	328	32	9.8
10	242	1	0.4	2	0	0.0	133	0	0.0	84	0	0.0

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[1] Source: Bureau of Mines Monthly Petroleum Statements and Ethyl Corporation.

[2] Source: Bureau of Mines Monthly Petroleum Statements and FEA Office of Oil and Gas Report of Oil Imports.

[3] Source: Bureau of Mines Sales of Fuel Oils and Kerosine, 1974.

Figure III-6

CONSUMPTION AND IMPORTS OF FUEL OILS IN EAST COAST FEA REGIONS

(000 Barrels Per Day)

1973 - 1974 Data

	Distillate Fuel Oil			Residual Fuel Oil		
Region	Consumption[1]	Imports[2]	%	Consumption[1]	Imports[2]	%
1	323	98	30.3[3]	409	291	71.1[3]
2	506	105	20.8[3]	638	496	77.7[3]
3	363	23	6.3	457	308	67.4[3]
4	357	8	2.2	365	303	83.0[3]

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[1] From BOM Fuel Oil Sales Annual

[2] From BOM Annual Petroleum Statement distributed by FEA Region according to Department of the Interior Oil and Gas Imports Data Base proportions.

[3] Indicates those FEA Regions and products for which imports totalled more than 20 percent of consumption for January 1973 through December 1974.

Figure III-7

PIES FORECAST CONSUMPTION AND IMPORTS OF FUEL OILS IN EAST COAST FEA REGIONS
(000 Barrels per Day)

1980 PIES BAU REFERENCE CASE

FEA	Distillate Fuel Oil			Residual Fuel Oil		
Region	Consumption[1]	Imports[2]	%	Consumption	Imports	%
1	410	136	33.2[3]	510	401	78.6[3]
2	803	-	0	640	282	44.1[3]
3	675	-	0	414	277	66.9[3]
4	568	-	0	305	203	66.6[3]

1985 PIES BAU REFERENCE CASE

FEA	Distillate Fuel Oil			Residual Fuel Oil		
Region	Consumption	Imports	%	Consumption	Imports	%
1	529	18	3.4	472	281	59.5[3]
2	865	-	0	668	130	19.5
3	810	-	0	454	48	10.5
4	736	-	0	283	-	0

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[1] Conversion from PIES Census Regions to FEA regions for both consumption and import forecasts were made through 1974 state consumption data for distillate and residual fuel oils presented in U.S. Bureau of Mines Sales of Fuel Oil and Kerosine in 1974, Tables 13 and 15.

[2] PIES forecast product imports from Caribbean/Central American sources include shipments from Puerto Rico and the Virgin Islands. The RPR does not require protection against shipments from these areas. Accordingly 108 MB/CD of distillate fuel oils and 316 MB/CD of residual fuel oil were subtracted from PIES forecast imports from this region. These numbers represent actual 1973 production of these fuels in Puerto Rico and the Virgin Islands as reported by the U.S. Bureau of Mines in International Petroleum Annual 1973, Table 2.

[3] Indicates those FEA Regions and products for which forecast imports total more than 20% of forecast consumption.

Figure III-8

NON-WESTERN HEMISPHERE CRUDE OIL IMPORTS BY CHARACTERISTICS (AVERAGE BARRELS/DAY)

SULFUR WEIGHT PERCENT

API GRAVITY	0.01-0.10	0.11-0.25	0.26-0.50	0.51-1.00	1.01-1.40	1.41-1.80	1.81-2.50	>2.50	
>47	41,250	0	150	1,100	0	0	650	600	43,700
45-47	17,500	29,250	350	0	0	0	0	0	47,050
43-44	82,850	75,750	350	0	1,600	1,050	450	550	162,600
41-42	14,350	10,100	0	0	6,650	0	0	0	31,100
38-40	9,200	16,900	0	71,850	12,550	1,800	0	0	112,300
35-37	59,750	332,400	17,620	20,000	19,600	17,700	2,100	750	469,950
34	153,100	27,150	3,000	4,900	31,650	36,800	8,050	50	264,700
33	14,450	13,900	0	1,150	157,900	222,250	27,100	0	436,800
32	1,350	2,150	0	1,200	7,050	76,850	4,750	0	93,400
29-31	14,000	82,200	2,700	62,300	40,300	103,100	10,400	3,900	318,900
25-28	0	19,200	3,850	650	0	3,700	0	25,200	52,600
<25	800	950	0	0	0	3,100	1,450	23,550	29,850
TOTAL	408,550	609,950	28,050	163,200	277,350	466,300	54,950	54,550	2,062,900

Source: FEA Dept. of Interior Oil and Gas Imports Data Base

Figure III-9

PERCENT EACH CRUDE OIL TYPE IS OF TOTAL NON-WESTERN HEMISPHERE CRUDE IMPORTS[1]

SULFUR WEIGHT PERCENT

API GRAVITY	0.01-0.10	0.11-0.25	0.26-0.50	0.51-1.00	1.01-1.40	1.41-1.80	1.81-2.50	>2.50	TOTAL
>47	2.0	---	---	0.1	---	---	---	---	2.1
45-47	0.8	1.4	---	---	---	---	---	---	2.2
43-44	4.0	3.7	---	---	0.1	0.1	---	---	7.9
41-42	0.7	0.5	---	---	0.3	---	---	---	1.5
38-40	0.4	0.8	---	3.5	0.6	0.1	---	---	5.4
35-37	2.9	16.1	0.9	1.0	1.0	0.9	0.2	---	23.0
34	7.4	1.3	0.1	0.2	1.5	1.8	0.4	---	12.7
33	0.7	0.7	---	0.1	7.7	10.8	1.3	---	21.3
32	0.1	0.2	---	0.1	0.3	3.7	0.2	---	4.6
29-31	0.7	4.0	0.1	3.0	2.0	5.0	0.5	0.2	15.5
25-28	---	0.9	0.2	---	---	0.2	---	1.2	2.5
<25	---	---	---	---	---	0.1	0.1	1.1	1.3
TOTAL	19.7	29.6	1.3	8.0	13.5	22.7	2.7	2.5	100.0

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[1] For preliminary analytical purposes only.

Figure III-10

QUANTITY OF EACH CRUDE OIL TYPE REQUIRED FOR THE ESR[1] (1000s of Barrels)

SULFUR WEIGHT PERCENT

API GRAVITY	0.01-0.10	0.11-0.25	0.26-0.50	0.51-1.00	1.01-1.40	1.41-1.80	1.81-2.50	>2.50	TOTAL
>47	3,000	---	---	150	---	---	---	---	3,150
45-47	1,200	2,100	---	---	---	---	---	---	3,300
43-44	6,000	5,550	---	---	150	150	---	---	11,850
41-42	1,050	750	---	---	450	---	---	---	2,250
38-40	600	1,200	---	5,250	900	150	---	---	8,100
35-37	4,350	24,150	1,350	1,500	1,500	1,350	300	---	34,500
34	11,100	1,950	150	300	2,250	2,700	600	---	19,050
33	1,050	1,050	---	150	11,550	16,200	1,950	---	31,950
32	150	300	---	150	450	5,550	300	---	6,900
29-31	1,050	6,000	150	4,500	3,000	7,500	750	300	23,250
25-28	---	1,350	300	---	---	300	---	1,800	3,750
<25	---	---	---	---	---	150	150	1,650	1,950
TOTAL	29,550	44,400	1,950	12,000	20,250	34,050	4,050	3,750	150,000

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[1] For preliminary analytical purposes only.

Figure III-11

QUANTITY OF EACH CRUDE OIL TYPE REQUIRED FOR THE SPR (1000s of Barrels)

SULFUR WEIGHT PERCENT

API GRAVITY	0.01-0.10	0.11-0.25	0.26-0.50	0.51-1.00	1.01-1.40	1.41-1.80	1.81-2.50	>2.50	TOTAL
>47	10,000	---	---	500	---	---	---	---	10,500
45-47	4,000	7,000	---	---	---	---	---	---	11,000
43-44	20,000	18,500	---	---	500	500	---	---	39,500
41-42	3,500	2,500	---	---	1,500	---	---	---	7,500
38-40	2,000	4,000	---	17,500	3,000	500	---	---	27,000
35-37	14,500	80,500	4,500	5,000	5,000	4,500	1,000	---	115,000
34	37,000	6,500	500	1,000	7,500	9,000	2,000	---	63,500
33	3,500	3,500	---	500	38,500	54,000	6,500	---	106,500
32	500	1,000	---	500	1,500	18,500	1,000	---	23,000
29-31	3,500	20,000	500	15,000	10,000	25,000	2,500	1,000	77,500
25-28	---	4,500	10,000	---	---	1,000	---	6,000	12,500
<25	---	---	---	---	---	500	500	5,500	6,500
TOTAL	98,500	148,000	6,500	40,000	67,500	113,500	13,500	12,500	500,000

Figure III-12

PRELIMINARY
CRUDE SEGREGATIONS & QUANTITIES FOR STORAGE

TOTALS

SEGREGATION CATEGORY				
API °	SULFUR WEIGHT %	PERCENT OF RESERVE	ESR QUANTITY (MMB)	SPR QUANTITY (MMB)
43-47	0.01 - 0.50	6.634	9.951	33.17
38-40	0.01 - 0.50	8.219	12.329	41.095
38-40	0.51 - 1.00	1.927	2.891	9.635
38-40	1.01 - 1.80	1.524	2.286	7.62
33-37	0.01 - 0.50	16.662	24.993	83.31
33-37	1.01 - 1.80	35.829	53.744	179.145
29-32	0.01 - 0.50	2.747	4.121	13.735
29-32	0.51 - 1.00	3.987	5.981	19.935
29-32	1.01 - 1.80	22.471	33.707	112.355
		100.000	150	500

Figure III-13

ESR AND SPR OIL STORAGE RATE PLAN

	CALENDAR YEAR (QUARTERS)																																
	1975				1976				1977				1978				1979				1980				1981				1982				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	Sub Total
Projected Total Crude Storage																																	
Incremental (MMB)									50		X		100			X			82				X		101		X			74			
Cumulative (MMB)											50				150				233				325				426				500		500
Rate (MB/D									185		X		222		X				195				X		281		X			206			
Cumultative Total (MMB)											50				150				233				325				426				500		500

IV. STORAGE AND RELATED FACILITIES

After determining the quantities and types of petroleum products to be stored in the ESR, the type and capacity of existing and potential facilities suitable for that storage can be specified, together with the general location of facilities, acquisition procedures, and transportation for filling the reserve.

TYPES OF FACILITIES

Several types of underground and aboveground facilities are being examined for the storage of crude and refined products for the ESR and the SPR. Underground facilities include existing and new caverns in salt domes, and existing (both operating and abandoned) and new conventional mines. Aboveground storage could be provided by steel tanks and oil tankers as well as other unconventional storage such as rubber bags.

As stipulated in the Act, the ESR will use existing storage capacity, particularly conventional mines and solution-mined caverns in salt domes, to the maximum extent practicable.

The preliminary results of cost and environmental analyses indicate that conventional steel storage tanks and oil tankers are less attractive than underground facilities, mainly because of their higher cost. Further study, particularly of tanks and conventional mines located in consumption regions, is being conducted; however, because of their potential for avoiding refining capacity limitations or transportation delays. Because of the complexity of this distribution analysis, a definitive decision on the possible extent of use of tank storage has not been made. The analysis will be reported and a recommendation will be made in the December 1976, report to the Congress.

Of the three most promising alternatives - converted solution caverns in salt domes, converted conventional mines, and steel tanks - the most cost-effective choices appear to be the existing solution caverns in salt domes and existing mines. Specifically, the full cost of converted solution caverns in salt domes or converted conventional mines and related port and pipeline facilities is estimated at $1.00 to $1.30 per barrel, while the cost of steel tanks is estimated at $5.00 to $12.00 per barrel.

A summary of the cost of the principal alternatives is shown below:

	Estimated Cost per Barrel With Port and Pipelines
Converted Salt Dome Caverns and Conventional Mines	$1.00 to $1.30
New Conventional Mines	$5.00 to $6.00
New Steel Tanks	$5.00 to $12.00
Leased Steel Tanks, per year	$1.80 to $3.00

Based on the preliminary estimates that distribution from Gulf Coast salt domes could be effected without delays during an emergency, and the lower cost of salt dome storage, the Plan for the ESR phase of the SPR will consist of underground facilities, including existing solution caverns in salt domes and existing (operating or abandoned) conventional mines converted for storage use. Should the existing mine and salt cavern sites be unavailable at prices comparable to newly constructed salt caverns, then the creation of new caverns in undeveloped salt domes will be undertaken, using the new technique of filling while leaching in an effort to reduce construction time.

In the SPR, the most attractive options are likely to be the filling of additional existing mines and solution caverns in salt domes at sites that are part of the ESR, and expansion of some of these salt dome facilities by leaching new caverns. Preliminary technical studies indicate that a large part of the SPR requirement of 500 million barrels can be met by expanding existing facilities in this way. The detailed study of refining and distribution needs to support the regions will be completed by December and storage within the regions will be included in the plan if it is found to be necessary.

In addition to existing salt caverns and mines, new undeveloped salt domes with virtually unlimited capacity, appear to be economically attractive as a means of providing sufficient storage capacity for the remaining requirements of the SPR. It may be necessary for distributional or environmental reasons to initiate construction on a new site rather than expand on existing caverns, even though, based on cost considerations alone, the latter would appear to be less expensive.

The final choice of facility storage types will be determined by availability of refining and distribution capacity, and by the costs (especially site-acquisition costs), and environmental impacts. Although facility-type recommendations for the SPR will not be made until later in 1976, it is anticipated that a combination of domes and mines will be included.

Solution Caverns in Salt Domes

Existing and newly leached caverns in salt domes are probably the most attractive storage form, from the standpoint of scheduling, cost, environmental, technical and security considerations.

Salt domes, formed several million years ago, are masses of salt that intruded or upwardly dislodged overlying rock formations. Near the surface they are generally 1 to 3 miles across, extending to greater dimensions with depth. The distance from the surface to the top of the salt for Gulf Coast salt domes varies from 0 to 4,000 feet or more. Rock salt has a combination of characteristics that makes it highly attractive for cavern construction and petroleum storage. If relatively pure and not interbedded with other types of rock, it is generally impervious to liquid and gas, has a compression strength comparable to concrete under the weight of the overlying and surrounding rock, moves like plastic to seal incipient fractures, and can be mined easily by dissolving (leaching) with water. Construction is feasible wherever an adequate water supply and conditions for brine disposal coexist.

The feasibility of using leached caverns in salt has been demonstrated in France and Germany, where significant amounts of crude oil are currently being stored, and in the United States, where natural gas and petroleum-related products have been stored. Space for about 60 million barrels of crude and refined product storage is already available near Manosque, France. One major crude oil facility is now under construction near Blexen, East Germany, where a 30-million-barrel facility is being developed and the West German Government is planning an 80-million-barrel facility near Etzel. In North America, over 900 solution-mined caverns, with a total capacity exceeding 300 million barrels, have been developed in salt deposits and converted for storage. These caverns store such diverse products as natural gas, propylene, propane, butane, ethylene, pentane, and other hydrocarbon fuels. FEA has examined the potential of the approximately 450 onshore salt domes in the Gulf Coast region; several offshore salt domes in the Gulf of Mexico; and major salt beds, especially those with existing mines or leached caverns.

Excluding caverns in use for hydrocarbon storage and others not ideally situated geographically with respect to the refinery distribution system, existing leached space (in excess of 200 million barrels in capacity) in salt domes in the Gulf Coast Basin--the only major salt dome basin within the continental United States--is potentially convertible for the ESR and the SPR programs.[1] A good portion of this capacity can be converted and filled in the 3-year ESR time-frame. Moreover, this capacity is located close to existing crude oil refining centers and related pipeline distribution networks, thus facilitating filling and withdrawal. In addition, environmental impacts associated with the conversion of existing caverns in salt domes, such as the use of large volumes of water and the disposal of saturated brine, do not appear to be severe and are being addressed in environmental impact studies.

Virtually an unlimited amount of new storage space can be provided through construction of new caverns in onshore and offshore salt domes in the Gulf Coast region,[2] most of which are geologically acceptable for such construction. No major technical problems are anticipated in constructing onshore leached caverns, and preliminary studies indicate that offshore construction and storage are feasible and would permit acquisition of oil for new caverns to commence a few months after leaching is initiated. Prototype-sized facilities of 50 million, 100 million, and 200 million barrels of capacity are being examined at a number of sites in the Gulf Coast area.

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[1] Although more sites are available for conversion, this estimate is based on the number of sites likely to be included in the ESR on the basis of feasibility studies, which consider cost, technical, distributional, and environmental matters as well as current use.

[2] While a large number of potential sites exist with virtually unlimited capacity, this potential capacity could not be made available so as to meet the earlier targets and requirements of the Act.

Like the existing salt caverns, the undeveloped salt dome sites are located in the Gulf of Mexico region, close to existing and projected crude and product transportation networks. No significant environmental impacts are expected from the construction of onshore facilities that utilize underground brine disposal or brine disposal at sea, where proper mitigating measures are followed. Offshore construction is more technically complex and is therefore being carefully studied. Offshore construction, however, offers three particular advantages: (1) the sites could be in federal waters (negligible acquisition cost); (2) the water supply for solution mining and petroleum withdrawal would be infinite, and minimum horsepower would be required for pumping; and (3) facilities could be easily concealed.

Bedded salt deposits like those in Michigan, New York, Montana, Wyoming, Kansas, Arkansas, and Texas were considered in the prefeasibility studies. Many of these bedded deposits have active and abandoned mines. In general, these beds are not easily accessible to the refinery-distribution system, and the existing mines could service only a limited area. Further, they frequently have significant salt creep associated with them and, in view of their relative thinness, are not as attractive technically, environmentally, or economically for storage of petroleum products as salt domes and other existing mines.

Mines

A second attractive type of petroleum storage facility is underground conventional mines. Although no crude oil is currently stored in mines in North America, the practice is in use in Europe and South Africa, where strategic and economic pressures have led to the use of mines. Within the United States, there are more than 20,000 operating or abandoned mines as well as extensive areas in which the rock is potentially suitable for the construction of new underground storage facilities.

Technical characteristics such as rock type, depth of excavation below the surface, cavern geometry, and control of water inflow are important in evaluating the suitability of an individual mine. To be useful as a storage site, a mine must be structurally stable; the surrounding strata must be relatively impermeable, free of fractures, faults, joints, and seismic activity; and the host rock must be nonreactive with the stored petroleum. Seepage into the mine is usually permissable or even desirable, and in some cases actually provided for during construction or conversion to contain the oil in the mine. The groundwater level, therefore, should be above the cavern to provide the necessary hydrostatic pressure to prevent losses of oil into the surrounding strata.

Existing underground mines with an estimated capacity of about 170 million barrels are potentially convertible for the ESR and the SPR programs.[1] A portion of this capacity is potentially convertible within the 3-year ESR timeframe. In addition, FEA is investigating the potential of numerous other sites that have been recommended as a result of public interest in the Act. Salt, limestone, and iron mines located in the South and Midwest appear to be the most attractive site possibilities. Some of the mines developed in salt domes were examined and found acceptable, whereas other mines are found in bedded salt deposits lying either too close to the surface or at excessive depths for feasible storage use (such as in the Michigan and Williston Basins and southern Arkansas). The environmental and safety impacts at each of the acceptable sites appear to be controllable. Coal mines were initially considered but eliminated for use in the ESR or SPR. Operating coal mines are too valuable for their coal; abandoned coal mines are generally structurally unsafe, may contain explosive gases, and usually have sealed entrance shafts that make inspection infeasible. New mines are not feasible for strategic storage of crude in the ESR because of their 3-year construction lead times as well as their estimated construction costs of $5-$6 per barrel.

Conventional Steel Tanks

Because of the high initial cost of construction, steel tanks that are currently being used for petroleum storage are kept in service to the maximum possible extent. Therefore, there is relatively little excess tankage available for lease on a continuing basis. However, nearly 15 million barrels of existing steel tankage have been identified and are potentially available in government-owned facilities or private tank farms for short- or long-term leasing from the private sector. In addition, potential sites for new tank construction, with several times this capacity, have been identified. The leased cost of tank storage estimated at approximately $1.80 to $3.00 per barrel per year varies from region to region. New tank construction varies from $5.00 to $12.00 per barrel depending on a variety of factors. These costs would of course rise if the government attempted to bid them away from private sector uses, and the result could be no net increase in national storage.

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[1] Although more sites are available for conversion, this estimate is based on the number of sites likely to be included in the ESR on the basis of feasibility studies, which considered cost, technical, distributional, and environmental matters.

Because of their relatively higher cost, the use of conventional steel tank storage has not been planned as part of the ESR on either a lease or purchase basis. If storage of residual or regional product is required and other less expensive methods are not suitable, the requirement would be satisfied through the use of available, excess, government-owned tankage, leased existing tankage, or leased new tankage.

Oil Tankers

The possibility of using idle oil tankers for the storage of crude oil or refined products is being examined. On the basis of this analysis, it has been preliminarily concluded that the storage of petroleum products in idle tankers is technically feasible for the ESR program. Indeed, they would provide a flexible means of storage near major ports and coastal refineries. However, the estimated cost of leasing such facilities is high compared with the costs associated with existing underground facilities. Further, there may be environmental impacts, such as hydrocarbon emissions, waste disposal, and leaks associated with tanker storage that would require careful and detailed studies, including costs of mitigating measures, before significant idle tanker capacity could be utilized, even if considered economically feasible. Finally, storm damage or collision could release large quantities of oil that would cause major environmental damage. Thus, the use of idle ocean tankers for storage purposes is not planned.

Other Storage Modes

The use of other storage modes, such as refilling depleted oil reservoirs, shut-in capacity, and double-lined synthetic rubber bags, have been examined. The slow withdrawal rates, the uncertain recovery factor, and the impracticality of several crude segregations eliminated depleted oil reservoirs from further consideration. Standby production capability was eliminated because of its inability to produce at a rate that will satisfy demand during a supply disruption.

Shut-in capacity has been eliminated as an alternative because it is too expensive, it has an insufficient withdrawal rate, and it is generally not well located in relation to existing distribution networks. The Elk Hills, California, Naval Petroleum Reserve (NPR-1), which has estimated reserves of 1.2 billion barrels, is an excellent illustration of the limitation of a shut-in reserve. Currently, NPR-1 is capable of producing approximately 130,000 barrels per day from existing wells within 90 days of production authorization. Furthermore, the Department of the Navy has estimated that the production capability could be increased to approximately 200,000 barrels per day within 5 years.

At maximum efficient rate (MER), then, it would take 7 years for the Elk Hill field to produce enough crude oil to meet the SPR storage requirement, (i.e., 500 million barrels). At 270,000 barrels per day, Elk Hills could produce only 48 million barrels during a 6-month interruption. Since there is a relationship between the size of the reserve and its pumping rate, a shut-in reserve of 10 billion to 20 billion barrels would be needed to provide the same level of protection afforded by the SPR. In addition to the oil field exploration and development costs and the opportunity cost of 10 billion to 20 billion barrels of oil, a major standby pipeline system would have to be financed and built to move the oil from the fields--in this case, California--to the areas impacted by an interruption--the East.

The technological and economic uncertainties of the double-lined synthetic rubber bags tend to make them unattractive for consideration in the ESR. But because of their locational flexibility and projected costs, which are comparable to salt caverns, these methods will be examined further.

FACILITY LOCATION

During the past 9 months, the FEA has conducted technical, distribution, environmental, and economic analyses of each of the major types of storage. The universe of possible storage sites for the ESR was examined, and those sites that were less viable candidates for further feasibility study were screened out. For example, because of the 3-year timeframe for the ESR, existing salt dome cavities, mines, and tanks were considered the prime candidates for the feasibility efforts, although the technique of filling while leaching could be used recognizing the schedule slippage. These feasibility studies were designed to identify those underground sites and tank-farm locations most suitable for further, detailed, technical and environmental studies, and resulted in the selection[1] of a number of sites throughout the country.[2]

FEA's examination of potential ESR sites is continuing and is scheduled to be completed in mid-1976. Preliminary discussions will be held with site owners in an effort to ascertain the feasibility of acquiring the properties through negotiation. Where necessary and appropriate, the Act's authority for acquisition by eminent domain might be employed. However, if condemnation procedures are considered inappropriate, site-specific feasibility studies and environmental assessments will be terminated and the site will no longer be a candidate for the program.

For the SPR, the FEA has been conducting detailed analyses of many undeveloped salt domes (including onshore and offshore locations) and major salt beds with different technical, distributional, and environmental characteristics, selecting for further analysis those sites that were most advantageous or desirable for petroleum storage. Time permitting, additional sites will be considered if the sites currently under investigation are found to be technically or environmentally unacceptable. These analyses are also scheduled for completion in mid-1976, and their results will be included in the SPR Plan. Considering the large number of developed and undeveloped salt domes under investigation, compared with the relatively small number needed for the SPR, it is unlikely that suitable properties cannot be acquired by negotiation or condemnation.

In making these preliminary site selections, the FEA has applied six major criteria: (1) near-term (i.e., 3-year) and longer term (i.e., 7-year) capacity, (2) accessibility to distribution system, (3) technical desirability, (4) extent of environmental impacts, (5) feasibility of acquiring the sites, and (6) costs. These same criteria, which are discussed in detail below, will be used in making the final selection of sites to be included in the ESR and the SPR Plans when final environmental, technical, and cost information is available in mid-1976.

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[1] Selection refers to the choice of candidate sites for further technical, cost and environmental study, and in no way implies a final decision has been made that any candidate site will definitely be utilized as part of the storage program.

[2] To preserve the government's position in acquiring existing salt cavern and mine sites and related distribution and tank facilities, the specific sites being considered and their cost estimates have not been included in this Plan.

Capacity

To respond to the needs of both the ESR and the SPR, candidate storage facilities were selected on the basis of their available capacity in the short term (i.e., 3 years) and their total capacity over the longer term (i.e., 7 years). Specifically, to provide the rapid storage capacity required for the ESR, efforts were concentrated on existing salt caverns and mines with potentially usable capacity prior to December 1978.

The initial candidate underground sites considered for the ESR have a combined capacity of about 15 million to 20 million barrels by June 1977, approximately 150 million barrels by December 1978, and approximately 200 million to 300 million barrels when completely converted. In addition, many can be expanded to accommodate further storage, as required, for the SPR.

Accessibility

To respond to petroleum demand during a supply interruption, storage sites must have access to appropriate existing distribution facilities (e.g., ports and pipelines).

Access to ports and pipelines was particularly important because, with the exception of petroleum imports from Canada, which were over 600,000 barrels per day in early 1975 but which will be terminated by the early 1980's all oil subject to disruption enters the United States by water. Of the average daily 4.1 million barrels of crude oil that entered U.S. ports in 1975, between 450,000 and 600,000 barrels per day were transshipped significant distances by pipeline. This crude oil flowed mainly to refineries in the Central petroleum market. The remaining 3 million barrels per day of crude were usually refined fairly close to the ports in which they were off-loaded--roughly 1.1 million barrels at East Coast ports, 700,000 barrels in Puerto Rico and the Virgin Islands, 600,000 barrels at Gulf of Mexico ports, and 600,000 barrels at West Coast ports.

To minimize response time during an emergency, the FEA selected for detailed consideration, facilities that could, to the maximum extent possible, be connected directly to major pipelines and/or ports. Ports will provide accessibility to the major areas of need--i.e., East Coast, the Louisiana and Texas Gulf region,[1] Puerto Rico, the Virgin Islands, and if necessary, the West Coast--and to secure refined-product sources in the Caribbean. In addition, an effort was made to select ESR sites with existing docks, pipelines, and waterways that could be used to expedite filling them.

To ensure that sites selected for both the ESR and the SPR would be able to store and deliver crude oil in appropriate quantities to meet regional requirements, the FEA determined likely requirements for each petroleum market. These requirements were based on: (1) the extent the market depends on petroleum imports; (2) the refining capabilities of each market (e.g., capacity and flexibility); (3) the capacities and flexibility of the petroleum distribution network; and (4) the extent of demand restraint in the market. Candidate sites have been selected to provide the greatest practical flexibility in providing for these markets.

Absence of Technical Restrictions

Potential sites with technical (e.g., structural) restrictions that would significantly delay construction or increase conversion costs were eliminated. All candidate sites and their related distribution facilities are believed to be free of any major technical conversion problems. Further studies are being conducted to determine how vulnerable the sites are to operational disruptions.

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[1] The Louisiana and Texas Gulf are also the originating points for the Texoma, Seaway, and Capline pipelines. Although these pipelines will be directly tied to storage facilities, they also could be reached by water in the event of unforeseen requirement levels or localized system failure.

Extent of Environmental Impacts

Each candidate site is being evaluated on a preliminary basis in terms of the potential environmental damage that might occur if the site were used for the storage programs.[1]

For salt caverns, each site is being evaluated on availability of fresh, brackish, or sea water for leaching or withdrawal of oil, and on ease of disposing of the saturated brine produced by leaching or by filling. (With cavern conversion, the brine generated is equal to the amount of oil stored, and occurs during the filling operation. New construction generates 7 barrels of brine for every barrel of storage developed.) Brine can be disposed of in nearby nonpotable waters, which may or may not be environmentally detrimental; injected deep into natural underground salt water aquifers near the dome; or disposed of in the Gulf of Mexico. The latter two methods appear feasible and have been used successfully in the past. In addition, many of the candidate sites are located near chemical plants that use saturated brine as feedstock, thus minimizing somewhat the brine disposal problem. In addition to water-related issues, salt caverns have the usual environmental problems associated with construction of access roads, pipelines, and on-site structures and with seismic hazard.

The environmental evaluations of conventional mines include consideration of the impacts of construction of pipelines, access roads, and corridors for utilities as well as flood and seismic hazard, the disposal of limited spoil and other water pollution problems, and the venting of hydrocarbon gases.

Acquisition Feasibility

Salt dome and mine sites were also evaluated in terms of how readily they could be acquired. Consideration was and is being given to whether the sites are developed (i.e., possess existing caverns) or undeveloped. In the case of operating mines the interests of the owner and lessor (if other than the owner) were considered and evaluated to determine whether the site could be considered a candidate for the program from the standpoint of relocation of operations.

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[1] A Draft Strategic Petroleum Reserve Programmatic EIS is scheduled for public release in May 1976. Site-specific environmental impact statements will be prepared and filed for each candidate site prior to selection as part of the ESR and the SPR programs. These site-specific EISs will be prepared in draft form commencing in May 1976.

Costs

For each candidate location, preliminary estimates have been made of the cost of the site acquisition, architectural and engineering design, construction and operation of the sites and related facilities (including pipelines, port facilities, and other distribution requirements), and environmental control. These costs will be used to compare the various sites from an economic standpoint when final site decisions are made.

ACQUISITION

The storage system in any one locale consists of one or more storage facilities and the ancillary pipelines, environmental controls system, pumping stations, tanks, terminals, and port facilities necessary to receive oil from and deliver it to the existing distribution infrastructure. The Government must acquire the property or right-of-way to all the elements of the storage system through purchase, lease, or condemnation. It is possible that some portions of the storage system will be government-owned and government-developed, while other elements will be privately developed and leased to the government.

In determining the feasibility of acquiring different kinds of sites, the FEA will have to take a number of factors into consideration for each type of site:

- Existing and undeveloped domes. The acquisition of salt caverns involves existing surface rights, mineral rights, storage rights where new leached caverns are required, and such other rights as may be required for storage security. The legal question about the rights to use existing caverns in salt domes for storage can be quite complex. In some situations, surface, mineral (either fee or lease-hold), and storage rights are held by different parties, making negotiation of a purchase difficult or lengthy.

- Existing conventional mines. Mines under consideration are either abandoned or currently operating. Again, surface rights, storage rights in created cavities, and mineral rights involving other necessary interests may have to be acquired. Legal problems associated with ownership of surface rights and storage rights exist here as well.

- New aboveground storage. Sites for constructing new aboveground storage are also being evaluated, and several suitable locations for which no acquisition problems are anticipated are under consideration. If the need for regional storage could be satisfied more economically by underground storage, no aboveground storage of products would be required.

Once the feasibility of sites has been determined and final site selections have been made, the actual process of construction/conversion begins.

Facility Construction/Conversion

The development of storage facilities for the ESR will require at least 2 to 2-1/2 years from inception of detailed facility design through completion of construction. The SPR program will take an additional 2 to 4 years to complete. To ensure that construction is completed in time, both programs will require significant private sector participation in the form of detailed feasibility studies; architectural and engineering designs studies; and actual construction of site facilities, connecting distribution systems, port facilities, water purification facilities, and aboveground support tankage. In addition, internal project scheduling and control measures will need to be established and enforced.

- Feasibility studies. The preliminary and site-specific feasibility analyses begun in July 1975 and scheduled for completion in April and May 1976 represent the first step in the construction process. The output of these studies, beyond establishment of technical feasibility, will be preliminary cost estimates, schedules, design drawings, and equipment specifications from which final design plans and specifications for selected sites will be developed. To the extent long lead-time material and equipment procurements (e.g., piping, pumps, casing, and wellheads) are on the critical path, preliminary equipment specifications will be developed so early procurement of these items can be initiated. Lists of material requirements are being developed, and the specifications of these requirements will be incorporated in procurement documents.

- Design studies. The purpose of the design phase for each site is to develop plans and specifications so that potential construction contractors may bid on developing the required facilities. The final design planning will extend over a 6 to 12-month period, beginning approximately June 1, 1976. The contractor qualification program to select suitable architectural/engineer/management firms that can accomplish detailed feasibility studies as well as preliminary and final design planning has already begun.

- Construction. Actual construction work will commence in the latter part of FY 1976, after completion of site-specific environmental impact studies, site selection, acquisition, and necessary design and engineering drawings.

  The construction work at each site will consist of facility development and related facility construction. Facility development includes cavern construction in the case of undeveloped sites, or enhancement of developed sites and all associated brine injection wells, valves, pumps, connections and lead lines. Related facilities include manifolds, pumps, and pipelines to port or major pipeline systems, and terminal facilities (e.g., docks and unloading facilities). For the most part, construction on these elements can proceed concurrently, with the appropriate connections to be completed at the end of the construction period. Preliminary scheduling indicates that distribution pipeline connections and terminal facilities will be critical in terms of construction time required.

  The construction contracting arrangements will probably differ from site to site. Where it is deemed appropriate and in the public interest, FEA will give full consideration to the present owner/leaseholder preferences for participation. For example, a number of candidate site owners have indicated an interest in undertaking certain parts of the site-related development work (e.g., cavern conversion to storage and associated site facility development) themselves. The owners of some of the major distribution pipelines and terminal facilities have indicated a willingness to evaluate the possibility of their undertaking some of the construction (e.g., tankage and pier construction) at the terminus of the distribution pipelines. Consequently, site-related construction could be included in the site purchase/lease contract with the present owner. Thus, private development of storage facilities for the government is an option to be considered. However, if the storage objectives of owner/leaseholders are not consonant with the interests of the government, storage will be developed by the government.

- *Project scheduling and control*. The 3-year ESR storage requirements impose a timing constraint on the site-development process that demands careful project management, especially of all design and construction activities. To this end, the FEA is currently installing a computerized project management system based on critical path method (CPM and PERT) scheduling techniques. Schedules will be developed for each site and, as the critical activities are identified, they will be carefully monitored. The selected construction managers will also provide detailed project scheduling and cost control. Early identification of the volume of construction contemplated within the time constraints of the ESR program may involve some material shortages. For example, several facilities to be developed concurrently in the same geographic location may cause spot shortages of construction labor and equipment. The project management system will be used to identify these resource constraints and to adjust schedules to expedite these items.

Of equal importance to the construction of the sites are their costs, the method of financing, and the time constraints in acquiring the sites.

Facility Cost, Financing, and Rate of Acquisition

ESR facility costs have been estimated and cost planning factors have been developed on the basis of feasibility studies. Based on these cost estimates, a 150 million barrel ESR stored entirely in underground storage would cost between $1.00 and $1.30 per barrel.

To ensure facility acquisition and construction to meet the ESR requirement of 150 million barrels in 3 years, storage facilities that could be filled to 150 million barrels in 3 years are proposed to be financed by the government through appropriations authorized by the Act.

To fulfill the ESR requirements of 150 million barrels within 3 years, FEA will begin to acquire sites and begin design/construction by October 1976. In addition, FEA has developed a stringent, 2-year schedule for underground storage facilities needed for the ESR. (See Table IV-2.)

Table IV-2

ESR UNDERGROUND STORAGE SCHEDULE

Time Period	Storage Capacity (In Millions of Barrels) Incremental	Cumulative
January-December 1977	60	60*
January-December 1978	90	150

* Although the Act establishes a target of 10 percent of the SPR (i.e., 50 million barrels) be in storage by June 1977, the FEA considers it unlikely that construction of underground facilities of this capacity can be accomplished by June 1977.

During development of the ESR, the design, purchase, construction, and lease of facilities for 200-300 million barrels of storage will be started. Due to fill rate limitations, only 150 million barrels of the total storage volume will have been filled during the first three program years, i.e., by December 1978. The remaining existing capacity at these sites will be filled for the SPR. The remaining capacity required to achieve SPR goals of 500 million barrels in 7 years could be achieved by creating new caverns in already developed storage sites or on virgin sites, depending on whichever is most cost effective in light of overall storage system distribution requirements.

TRANSPORTATION

As part of the preparation for ESR storage sites, distribution systems for each site will be designed and constructed so that, in aggregate, the sites can receive and deliver crude oil at rates sufficient to meet program targets. For sites that have direct access to port facilities, the transportation system will consist of a pipeline running from the site to dock facilities and possibly to a major pipeline. For inland sites, the related distribution facilities will consist of a pipeline extending from the site and connecting with a major pipeline such as Capline.

To the maximum extent possible, site-related distribution facilities will be coordinated with existing facilities. For all inland sites, preliminary study indicates that adequate unused capacity to meet fill rate targets exists in the related major pipelines and their dock facilities. However, many of the sites with water access will require the construction of new, or modification of existing, port facilities. These new or modified facilities would be used for withdrawal of stored petroleum as well.

The Maritime Administration (MARAD) is assisting in the study of water-related facilities by analyzing:

- Port facility requirements and associated costs to meet fill and withdrawal rates.
- Regulations and authorities that would affect water traffic or construction of port facilities associated with the reserves.
- The availability, sources, and costs associated with tankers and barges needed for the transport of reserve oil during both fill and potential withdrawal periods.

In addition, they are developing a distribution model to simulate traffic movements.

To meet the timed fill requirements for the ESR, fill of storage facilities will occur at an average rate of 270,000 barrels per day from early in 1977 to completion of the reserve in 1982. This delivery level would require not more than 3 million dead weight tons (dwt) of tanker capacity.[1]

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[1] This figure is based on the conservative assumptions that all fill crude is transported in tankers with an average round-trip time of 80 days, and that there are 6.5 barrels of crude oil for each dwt.

Given the magnitude of existing excess tanker capacity as a result of a prolonged slump in the worldwide market for tankers, it should not be difficult to secure up to 3 million dwt at reasonable rates. For example, at the end of 1974, the world tanker fleet totaled 255 million dwt capacity with another 53 million dwt scheduled for delivery in 1975 and 1976, while demand stood at less than 215 million dwt. In early 1975, about 7 million dwt were idle in the Persian Gulf alone, waiting for spot cargoes; in 1976, tanker availability is estimated at 16.5 percent, dropping to 13.1 percent in 1977. In addition, the world's Very Large Crude Carrier (VLCC) fleet was slow steaming at twelve knots instead of the usual fifteen knots. However, water depth at port facilities associated with ESR and SPR sites will place constraints on the size of tankers that could be serviced at any site. The FEA, with the assistance of MARAD, is currently pinpointing acceptable tanker sizes for each candidate site. Preliminary findings indicate that most program-related port facilities will not be able to accommodate tankers larger than 50,000 dwt. Therefore, if larger tankers were used, the crude oil would have to be reloaded onto barges. Initial study indicates that this process would be significantly more expensive and that barge availability may pose a problem. Therefore, the requirements for barges are being examined in more detail, and steps are being taken to minimize program dependence on them during fill.

V. MONITORING AND CONTROLLING THE RESERVE

The ESR will require procedures and mechanisms to ensure the integrity of the purchase, transport, storage, and distribution of the crude oil and refined products stored in the reserve. Four types of controls and monitoring are required:

- Financial audit controls
- Purchasing and receiving controls
- Site security and storage monitoring
- Withdrawal controls.

These controls are necessary to minimize costs and maintain the integrity of the system. The integrity of the storage system is necessary to ensure that policy decisions and operations are based on accurate data, and to ward off the severe adverse consequences that could accrue during an energy supply interruption from a loss of integrity.

FINANCIAL AUDIT CONTROLS

Auditing controls and procedures will be developed for all government-owned and privately owned/government-leased facilities. Documents will be developed and maintained for all activities, including acquisition and development of facilities, filling, inventorying, maintenance, and withdrawal. Each seller, purchaser, monitor, and administrator at the regional and national levels will be responsible for maintaining documents that readily lend themselves to audit.

FEA auditors will perform frequent regional and national audits; less frequent audits will be performed by private auditing firms to provide checks as needed. In the case of privately owned/government-leased storage facilities, the leases will include a requirement to create and maintain a custody and auditing system. In addition, before such facilities are leased, the FEA will: (1) establish criteria, (2) review internal control systems of firms wishing to participate in the program, (3) certify qualifying firms and facilities, and (4) advise unqualifying firms on improvements necessary to meet criteria.

PURCHASING AND RECEIVING CONTROLS

Stringent measurement controls will be developed and used for the filling process. These controls will be in effect at receipt of product, during fill, and at completion of fill. At delivery, the product will be inspected for its specific gravity, sulfur content, viscosity, and sediment to ensure that various grades of crude and product are not mixed, and that the product already in storage is not degraded. The data obtained will be recorded and cross-checked with purchase orders. Throughout the fill, samples will be analyzed for chemical composition. After the fill, samples will be taken periodically, and quantity and quality measurements will be made.

SITE SECURITY AND STORAGE MONITORING

During the storage of crude oil, it will be necessary to protect the facilities against theft, fraud, sabotage, and fire or other physical damage. To this end, FEA will establish site security and storage monitoring systems.

The FEA will provide for regular maintenance and fire protection of all government-owned and -leased storage facilities and pipelines. Security forces will be supplemented by such mechanical means as fences, ground lighting, locks, and personnel-access security systems. In addition, the integrity and reliability of facility personnel will be ensured through careful background investigations, hiring practices, bonding, and job rotation.

If an IPR is implemented and any portion is stored in nongovernment facilities, industry would be responsible for the physical security of the facilities and petroleum products. However, these facilities would be subject to audit and inspection by the government.

Scheduled and unscheduled inspection and checks of inventory will be carried out. During such checks, investigators will verfiy that the actual volumes of storage indicated by the monitoring system match the audited records. Specimens of the stored petroleum products will be laboratory-tested to ensure that the audit-indicated type of inventory matches actual storage type, and that no product degradation has occurred.

Inventory will also be inspected periodically for contamination. Peculiarities of each storage method will necessitate monitoring for specific problems such as loss of site integrity, contamination from seepage, and control of brine/water displacement in underground storage.

Finally, measurement and monitoring gauges will be inspected frequently to ensure the integrity of the equipment. Loss or change-of-fill tolerance limits will be established, and deviation from accepted standards will result in immediate investigation.

WITHDRAWAL CONTROLS

A strict system for governing and controlling withdrawal from the facilities will be developed and implemented. No withdrawals will be made without the proper authorization. As with filling, withdrawals will be metered and checked against monitor-indicated volumes before and after withdrawal.

VI. USING THE RESERVE

The measure of the ESR's effectiveness will be its ability to lessen adverse economic, social, or political impacts on the nation that might result from an interruption of petroleum supplies. Even the threat of a supply interruption could have adverse economic impacts. Because it relies so heavily on planning and long lead times, our highly integrated economy is vulnerable to such a threat. The embargo of 1973 came suddenly. Although there was a several-week supply already in storage or in transit, even the prospect of a shortage caused confusion, uncertainty, and economic disruption. The distribution plans to be developed for the ESR and the SPR are intended to reduce our vulnerability to the threat as well as the actuality of a future supply interruption.

Congress has authorized FEA to prepare a number of responses to any future supply interruption, including:

- Voluntary demand restraint programs and the machinery of the allocation program that can be activated almost immediately.
- Production of domestic petroleum from certain fields at higher than normal rates (temporary emergency rates of production).
- Energy conservation contingency plans which would be implemented after approval by Congress.[1] These plans, which would impose reasonable restrictions on public and private use of energy, will be implemented so as to be consistent with the level and projected duration of the import disruption and with the amount of reserves on hand. During this period, FEA would adjust the reserve drawdown rate to minimize adverse economic impacts, taking into consideration demand restraint programs, the public's ability to adjust to the shortage, the amount of reserves remaining, and estimates of the duration of the shortage.
- Rationing contingency plans which would be implemented after approval by Congress.[2] However, be-

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[1] Section 201 of the Act established procedures to be followed by the President before implementing energy conservation contingency plans.

[2] Section 201 of the Act established procedures to be followed by the President before imposing a rationing contingency plan.

> cause of the large investment required for gasoline and diesel fuel rationing, and because of its disruptive influence on people's lives, this tool would be used only if other, less pervasive measure proved insufficient.

As the foregoing indicates, in the event of a serious supply interruption, one of the early steps is the activation of the ESR (or SPR). To understand how the reserve would be activated and used, this portion of the plan addresses: (1) the trigger mechanism; (2) drawdown strategy; (3) allocation; and (4) distribution. A more detailed description of this portion of the plan will be completed prior to the initial storage of oil.

TRIGGER MECHANISM

Section 161(d) of the Act authorizes the President to activate the ESR and the SPR distribution plans. Specifically, the President may order distribution in the event of a "severe petroleum supply interruption"[1] or to satisfy an obligation of the United States under the IEP.

In the case of a severe supply interruption, the Administrator of FEA will recommend to the President specific action on the use of the reserve. To enable the Administrator to make this recommendation, FEA will need to identify the probable scope and effect of a U.S. supply interruption before its impact is felt. A disruption would probably be preceded by diplomatic warnings or at least by notification from shippers and refiners of interruptions in incoming shipments. Once curtailmentsare indicated, FEA will identify the extent of the potential shortfall by reinstituting a weekly reporting system similar to that used during the 1973-74 disruption. This system, which has been improved on the basis of FEA's experience during that embargo, will include reports by importers and refiners of imports in transit, domestic production and import receipts, inventory levels, refinery throughput, and sales or usage.

In view of the dynamics and sensitive nature of a deliberate supply interruption, it is not wise to select an absolute level as the trigger for activating the ESR and the SPR. The President must have the flexibility, within the legal requirements, to deal with various contingencies. Thus, several factors of critical importance in making such a decision will probably not be known until the interruption actually occurs. These include the extent, source, and estimated duration of the disruption and the extent of U.S. dependence on foreign imports at the time. The projected impact of the interruption on our economy and the amount of supplies available to refiners will be of particular importance to FEA in making its recommendation to the President.

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[1] A severe energy supply interruption is defined in the Act as "a national energy supply shortage which the President determines: (a) is, or is likely to be of significant scope, and duration, and emergency nature; (b) may cause major adverse impacts on national safety or the national economy; and (c) results, or is likely to result, from an interruption of imported petroleum products, or from sabotage or an act of God."

Given this approach, a small import shortage (e.g., less than 4 percent of total domestic consumption) would probably not activate the reserve; a shortage of this magnitude could be met by a combination of emergency increases in domestic production and institution of minor demand restraints. A moderate shortage (e.g., 4-6 percent of total domestic consumption) would affect employment and GNP negatively to some extent, but could be managed by more stringent demand restraints and by the allocation program, without requiring the use of reserves. For a shortfall of this size, a decision to use the reserve would depend on the nature of the interruption--i.e., the likely length of the cutoff and the need to minimize adverse economic impacts. Finally, a large shortage (e.g., greater than 6 percent) would probably result in a recommendation to use the reserve. FEA's current analysis indicates that a sudden reduction of this magnitude would have to be offset by the reserve to avoid significant losses in GNP and employment.

Within 10 days after a disruption is announced or becomes apparent, or within 10 days after an interruption in excess of 2 percent of consumption occurs, FEA will make a recommendation to the President concerning use of the reserve. In addition, FEA will submit weekly status reports to the President during a supply interruption in excess of 2 percent of consumption.

DRAWDOWN STRATEGY

The nation will be most vulnerable to an interruption during the early years of the program--i.e., before the entire SPR is in place. If it were not prudently managed, the ESR could be exhausted in a relatively short time. During this period, if the nation were to suffer a serious supply interruption, demand restraint measures must accompany a carefully limited drawdown of the ESR. Once the ESR is activated, FEA will monitor and adjust the drawdown rate. This rate will be determined by the amount of petroleum in the reserve, the origin and size of the shortfall,[1] the likely duration of the disruption, the amount and timing of attainable demand reduction, and the GNP and employment implications of alternate drawdown rates.[2]

The initial ESR drawdown rate would be fairly high because of the time lag in realizing savings in demand restraint measures.[3] However, if the interruption continued, the drawdown rate would have to be curtailed, even if demand restraint measures did not succeed, to cushion the adjustment on the part of end-users to lower consumption levels, while minimizing employment and GNP losses and inconvenience to the public. If the total consumption rate had to be lowered, demand restraints and reserve drawdowns would be progressively tightened, as required.

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[1] The size of the shortfall will be determined by the direct interruption experienced and by the operation of the International Energy Program (IEP). The emergency provisions of the IEP are designed so that the burden of an interruption (a decrease greater than 7 percent of consumption in one or more participating countries) will be shared among the participating countries. Operation of the IEP could influence the impact of an import interruption upon the U.S. (increasing it if other countries were proportionally more severely affected and decreasing it if only the U.S. were interrupted) but it would not limit the use of the SPR because use of reserves in excess of agreed levels (currently 70 days of imports (is in the discretion of each country. Since industry working inventories qualify a reserves under IEP rules, the U.S. already has approximately 120 days' supply at existing import levels for IEP purposes. Working inventories cannot be reduced, however, without impairing supply and distribution operations.

[2] FEA is developing a cost/benefit model to estimate the effects on the economy of various levels of shortage, storage withdrawal, and demand restraints. This model will enable FEA to monitor, integrate, and interpret the factors that must be weighed to arrive at the most efficient consumption and drawdown rates during an import disruption.

[3] FEA analysis has indicated that currently available demand restraint measures are not likely to reduce demand by more than 1 million barrels a day, 200,000 to 300,000 barrels of which would be motor gasoline. Further lowering of the demand probably could be accomplished only through severe, mandatory demand restraint measures that would probably involve gasoline rationing and a mandatory refinery yield program to limit gasoline production.

Industry can usually make adjustments to the first shortage increment, with little loss in production, by eliminating inefficient or optional practices. Adjusting to subsequent increments of supply reduction will be more difficult. As the petroleum shortage increases, industry's ability to maintain production and employment levels by modifying internal processes decreases.

Given the fact that the GNP loss increases at a much greater rate than petroleum consumption declines, it is desirable to level out the consumption reduction to the extent possible during a supply interruption, to minimize resulting economic disruptions. But the advantage of evening out the availability of oil will have to be weighed against the uncertainty of duration of the supply shortage. Because of this uncertainty, any strategy chosen will have to be a flance between drawing down enough reserves to limit employment and production losses in the short term, and promptly instituting sufficient demand restraints so that the reserve could be used at a more uniform rate over a long period of time. FEA will develop a dynamic strategy that will tend toward greater initial use of reserves and subsequent reduction in use as the shortage continues. This strategy will allow the economy and the public to adjust to new lower energy-use patterns as the reserve declines.

ALLOCATION

The recent extension of the Emergency Petroleum Allocation Act of 1973 provided for a conversion of price and allocation controls to standby authorities, which will remain available until 1981 to help meet a supply shortage of sufficient severity to require use of the reserve. FEA expects use of the reserve would tend neither to increase nor to decrease average prices.

The regulations for any allocation program would be those in effect under Section 4 of the Emergency Petroleum Allocation Act of 1973 or similar regulations introduced as a result of the emergency.

DISTRIBUTION

In studying how the drawdown from the ESR and the SPR would be distributed, the FEA identified the eight storage areas listed below:

	Storage Area	Petroleum Markets Comprising the Storage Area
1.	East Coast	Northeast Atlantic
2.	Capline-St. James	St. James
3.	Texoma-Port Neches	Port Neches
4.	Freeport-Seaway	Freeport
5.	Downstream Midwest	Northern Inland Southern Inland Central
6.	West Coast	Contiguous West Coast
7.	Noncontiguous	Caribbean Noncontiguous West Coast
8.	Offshore	

Figure VI-1 shows a map of these areas, each of which contains major existing distribution facilities (see Figure VI-2). For example, the Capline-St. James area contains ports along the Mississippi River, such as St. James and New Orleans, and is the point of origin of the Capline Pipeline.

An important requirement for selection of the initial sites for conversion of salt domes and mines will be their accessibility to the major pipelines that deliver crude oil to inland refineries -- Capline, Texoma, and Seaway. Equally important will be the availability of port facilities for unloading and loading of ships, including the possible use of barges for lightering ships or for movements to other Gulf ports.

It is essential to the success of the program that the ability to move reserve crude to refineries and products to consuming markets be assured. Storage sites and the substitution of crude oil for products cannot be determined solely on the basis of the lowest cost for facilities without regard for the effective operation of the reserve during a severe supply interruption.

Thus, based on projected petroleum market needs, site availability, and access to distribution facilities, storage sites in only the first 5 storage areas are being considered in the ESR. Because the Virgin Islands and Puerto Rico have ready access to reserve crude stored in the Gulf, there will be no need for costly tank storage on those islands. The elements of the analysis however are complex, and many decisions cannot yet be made. For example, no decision can be made at this time concerning storage for Alaska, Hawaii and Guam due to significant production and refining uncertainties. These concern future production of oil from Prudhoe Bay, Alaska, the Gulf of Alaska, and NPR-1, as well as whether new refineries will be built that could service Hawaii, Alaska and the West Coast.

Preliminary analysis indicates, however, that even if no idle shipping capacity existed prior to a supply interruption, there would be sufficient international capacity to move the petroleum from storage to refineries and to markets. American ships and ships from friendly nations would be idled by the supply interruption, and the average round-trip times for tankers carrying reserve crude would be considerably less than round-trip times for tankers carrying imports. (See Table VI-3 and VI-4). Use of foreign flag vessels for transport between U.S. ports would, however, require a waiver of Jones Act provisions.

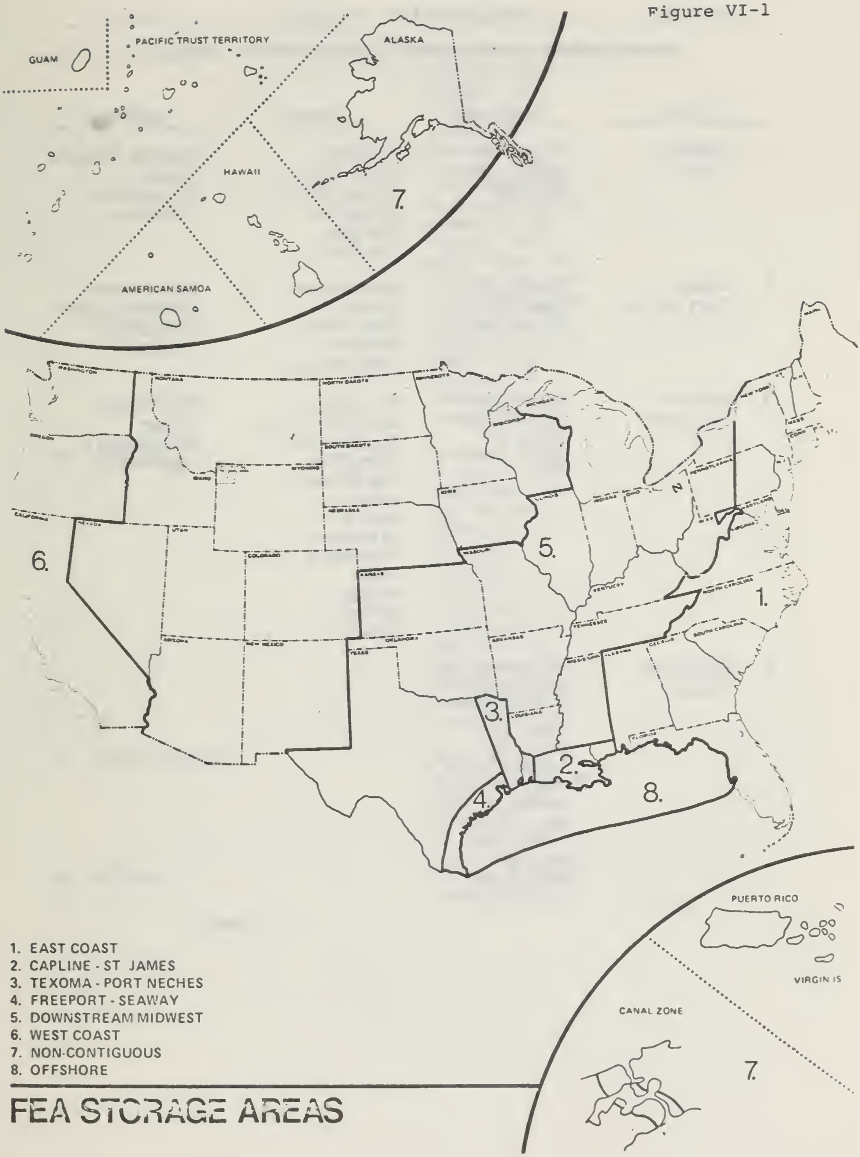
Moreover, transit times would be greatly reduced compared with shipments from producing countries, such as 50 days the round-trip time from the Middle East via the Suez Canal. (See Figure VI-1). By comparison, round-trip transit times from Gulf Coast storage sites would be approximately 14 days to Atlantic ports and six days to the Caribbean. A Gulf-to-East Coast movement of crude would thus require less than one-third of the ship tonnage now required for Middle East-to-East Coast shipments. For Gulf-to-Caribbean movements, less than one-eighth of the tonnage for Middle East shipments would be required. Movements from the Caribbean to the East Coast would continue at the same or lower levels as before a supply interruption.

Although shipments from the Gulf would require shallow draft vessels or lightering to deep draft ships, the reduction in tonnage requirements, combined with the lower level of consumption that would be enforced during a severe shortage, support the preliminary conclusion that shipping capacity would be available and permit at least major reliance on storage in low-cost salt domes and mines in the Gulf.

Sites for ESR storage will be designed with connections to ports and existing pipelines so that interrupted crude imports can be replaced from storage to the extent provided by a drawdown and allocation plan in effect at the time.

Despite this preliminary indication, the factors in the distribution analysis are complex. Detailed analysis of shipping requirements and capabilities under various supply interruption conditions is continuing and will be discussed extensively in the December 1976 report to Congress. The ESR plan reported here covers only the early implementation of plans in areas where there is no significant question about their inclusion in the final SPR program.

Figure VI-1



FEA STORAGE AREAS

Figure VI-2

TRANSPORTATION FACILITIES WITHIN STORAGE AREAS

Area	Pipelines	Ports	Waterways
1. Freeport-Seaway	Seaway 36" Humble 16" Phillips	Freeport Texas City Corpus Christi Galveston Houston Sea Dock	Houston Shipping Lane Intracoastal Waterway
2. Texoma-Port Neches	Texoma 26" Texas 22" Cities Service	Port Neches Orange Port Arthur Beaumont Lake Charles	Lake Charles Shipping Canal Intracoastal Waterway
3. Capline-St. James	Capline 40" Humble 2-16" Texas 22" Shell 16"	St. James Donaldsonville San Gabriel Hahnville New Orleans Sulphur Venice Pilottown Plaquemine Loop Meraux Norco Convent	Mississippi River Intracoastal Waterway
4. Downstream Midwest	Mid Valley 22" Ashland 24" Capline 40" Ozark 22" Shell 10" Texaco-Cities Service Mobile 20" Amoco 8", 2-12", 20" Arco 22" Chicap 26"		

(Cont.)

Area	Pipelines	Ports	Waterways
5. East Coast		Portsmouth, NH	
		New York, NY	
		Buffalo, NY	
		Dover, NJ	
		Linden, NJ	
		Newark, NJ	
		Paulsboro, NJ	
		Perth Amboy, NJ	
		Port Reading, NJ	
		Westville, NJ	
		Chester, PA	
		Marcus Hook, PA	
		Philadelphia, PA	
		Delaware City, DE	
		Wilmington, DE	
		Baltimore, MD	
		Newport News, VA	
		Yorktown, VA	
		Savannah, GA	
		Pensacola, FL	
6. West Coast		Benicia, CA	
		El Segunda, CA	
		Long Beach, CA	
		Los Angeles, CA	
		Martinez, CA	
		Paramount, CA	
		Richmond, CA	
		San Francisco, CA	
		San Pedro, CA	
		Wilmington, CA	
		Portland, OR	
		Anacortes, WA	
		Bellingham, WA	
		Ferndale, WA	
		Tacoma, WA	
7. Non-Contiguous		Pearl Harbor, HA	
		Barbers Point, HA	
		Honolulu, HA	
		Ponce, PR	
		St. Croix, VI	
8. Offshore		Dedicated Single Point Mooring	

Figure VI-3

ROUND TRIP TANKER TRANSIT TIMES
(Under Normal Supply Conditions)

Origin	Destination (Petroleum Market)	Round Trip Transit Time[1]
Middle East (Via the Suez Canal)	Atlantic Caribbean Port Neches St. James Freeport	50 days
Middle East (Via the Cape of Good Hope)	Atlantic Caribbean Port Neches St. James Freeport	68 days
West Africa	Atlantic Caribbean Port Neches St. James Freeport	31 days
South America (Venezuela)	Atlantic Caribbean Port Neches St. James Freeport	18 days
Indonesia	Atlantic Caribbean Port Neches St. James Freeport	80 days

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[1] Includes loading and discharge time totaling 4 days. Assumes a steaming rate of 15 knots.

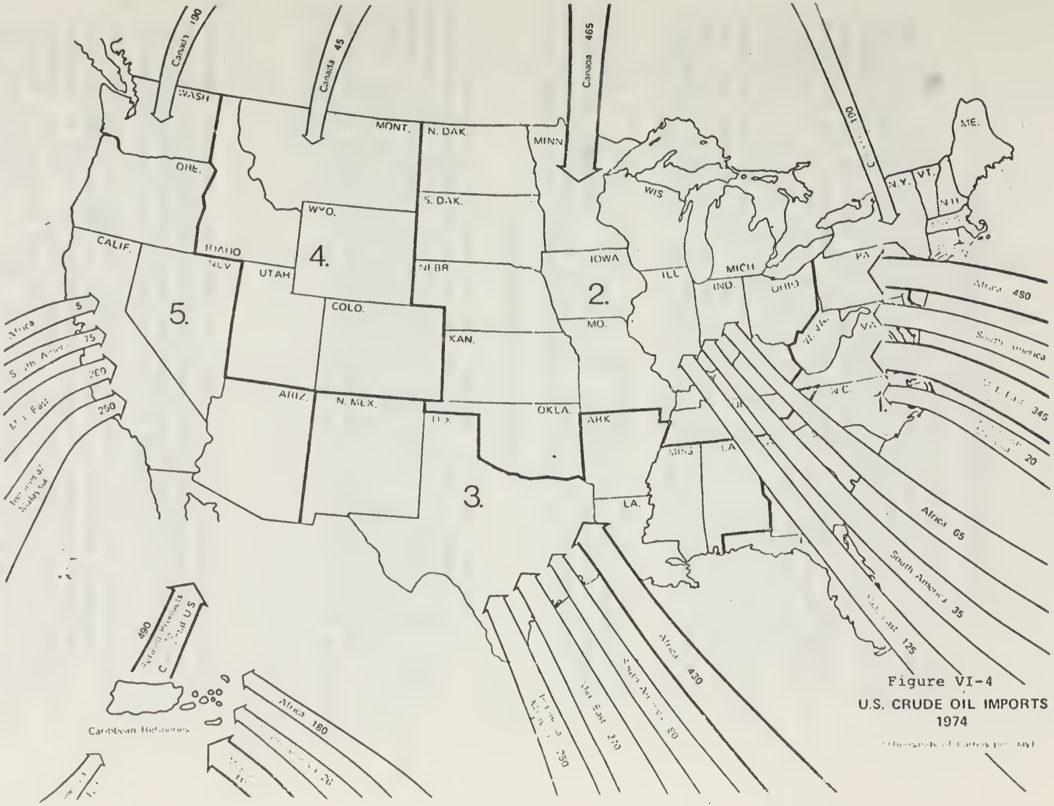

Figure VI-4
U.S. CRUDE OIL IMPORTS
1974
(thousands of barrels per day)

VII. ENVIRONMENTAL AND ECONOMIC IMPACTS

The Energy Policy and Conservation Act requires that the ESR Plan contain certain analytical elements, including (1) a comprehensive environmental assessment; (2) an evaluation of the market impacts of developing the reserve, taking into account the availability and the price of supplies and equipment and the effect, it any, on domestic production of acquiring such supplies and equipment for the reserve; (3) any fluctuation in world and domestic market prices for petroleum products that may result from the acquisition of substantial quantities of petroleum products for the reserve; (4) the extent to which such acquisition may support otherwise declining market prices for such products; and (5) the extent to which such acquisition will effect competition in the petroleum industry.

All of these issues are discussed in the following two sections. The first presents an environmental assessment of the ESR program. The second, covering aggregate economic impacts, describes the potential impacts on international trade, employment expenditures and inflation.

ENVIRONMENTAL IMPACTS

A substantial portion of the ESR will be stored in existing solution-mined salt caverns in salt domes and conventional mines in salt and limestone. But if, for any reason, it becomes impractical to store in existing caverns, it is likely that new solution-mined caverns in salt domes[1] will be used. The potential environmental impacts from each of these three types of storage have been evaluated and the preliminary conclusions[2] are detailed in this initial section of the chapter.

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[1] Because the decision has been made that aboveground tank storage will not be used for the ESR, the potential environmental impacts of surface tank storage have not been evaluated and included in the ESR Plan.

[2] A draft environmental impact statement will be issued on the program in May of 1976. After a suitable comment period, a final environmental impact statement will be issued in July. Additionally, site-specific environmental impact statements are being prepared for those sites that are candidates for use in the program. These will be issued in draft form beginning in May, and the final statements for those sites selected for use in the program probably will be issued in August.

EXISTING SOLUTION-MINED SALT CAVERNS

The storage of crude oil in existing caverns will require activities that may impact on the environment. These activities are: (1) conversion and preparation of each facility for storage purposes; (2) transportation of oil to and from the storage site; (3) fill and maintenance of the storage facilities; and (4) use of the reserve. The potential impacts associated with these activities are summarized in Figure VII-1 and are more fully discussed below.

Facility Conversion and Preparation

Conversion and preparation of the facility will involve the construction of on-site support facilities and small feeder pipelines to the central distribution network. It may also involve a limited amount of leaching to modify the shape or size of the underground cavern and thus require the disposal of the brine generated in the process. However, extensive modification of the caverns is not anticipated.

Facility conversion and preparation may result in the following types of environmental consequences:

1. Hydrology. The potential impact on water quality and quantity arises from the need to dispose of the brine generated during cavern modification. A discussion of specific impacts is contained in the subsection on "Filling and Maintenance," on page VII-7.

2. Biology. The conversion of each cavern will require 1 to 2 years of construction. This activity will create noise and disturbances by humans that will cause larger animals to avoid the area and seek new habitats nearby. If suitable habitats are not present or if resident populations have saturated the area, animal populations in that area will decline. This impact, which could occur to some extent at every site, will not severely damage the region as a whole since the area involved is small in comparison with the available wildlife habitat.

3. Air Quality. During the required construction period, the quality of the air around the site will be affected by the generation of dust, which is typical of

construction activity. The quantity of these emissions will vary from site-to-site, depending on the ground cover, amount of construction, and local meteorological conditions. These emissions will last only through the construction period (1 to 2 years) and may be effectively controlled with the regular wetting of the construction site.

4. Noise. The construction activity will also generate noise, which may have an impact on wildlife habitat in the immediate vicinity. The noise source will be primarily machinery. Although noise emissions from construction equipment could interfere with outdoor human activity 1,500 feet from the site, they can be effectively reduced by acoustical treatment of engines and motors and the use of mufflers.

5. Land Use. Land-use patterns will not be greatly affected since existing caverns will be used. Expansion of refineries, petrochemical plants, or associated commercial and economic development is not expected to occur in adjacent areas, since this type of development is not associated with the storage program. The need to construct additional support facilities (e.g., brine injection wells, pipelines, terminals, and docks) would intensify the use of a small amount of industrial land, however. In addition, a pipeline right-of-way may be required if existing easements or rights-of-way are not available.

6. Employment. Existing salt dome caverns to be converted for the ESR program range in capacity from approximately 15 million barrels to 90 million barrels. The small domes will require approximately 16 workers for 3 months for drilling and 30 workers for 1 year for construction. The larger domes will employ workers for drilling and construction. These two activities can proceed concurrently, and the maximum construction employment on any single dome could exceed one hundred workers. Skilled personnel are required for these activities and there appears to be an ample supply of appropriately skilled labor in the vicinity of the candidate storage sites.

Conversion of the existing salt caverns will also stimulate secondary construction employment effects associated with the provision of services to construction workers and the manufacture of equipment and supplies.

On the largest salt dome storage facility (90 million barrels), the secondary construction employment is expected to reach 539. The total direct and secondary construction employment for the ESR has been estimated at 4,300, spread throughout the Gulf region. It is very likely that all of this employment will be provided from the existing Gulf region labor force.

7. Regional Economic Activity. Conversion of existing salt caverns to oil storage facilities will affect the regional economy. In some cases, the effects will spread beyond regional boundaries, depending largely on where equipment and supplies are purchased. However, since most of the materials needed during construction are manufactured in the Gulf region, most of the economic effects will be confined to this area.

The direct expenditure associated with the conversion of a 90-million-barrel storage facility is expected to be $24.7 million per year. The regional economic impact of this expenditure would be about $69.4 million per year. The total increase in personal income resulting from both direct and secondary construction is estimated at $18.8 million.

8. Taxes. Tax revenues generated by the conversion of salt domes will include the direct taxes paid as part of the project (e.g., sales and excise taxes) and indirect taxes from the household income generated (e.g., property and income tax). The yearly tax revenue resulting from the conversion of a 90-million-barrel facility would be small: federal, $4.94 million; state, $0.55 million; and local, $0.012 million. These figures do not include any tax on the value of the facility itself or the land associated with it. The amount of property tax paid locally will depend on whether the government owns or leases the property and its related facilities. With government ownership, local property taxes would decline by the amount formerly paid on the land; under partial or complete private ownership, local tax revenues would increase.

9. Public Safety. The risk to public safety associated with the existence and development of caverns is minimal. Fire and explosion are unlikely because of the general lack of oxygen in the cavern. The

risk of damage to the cavern from natural phenomena is minimal since the cavern is underground. Only a small amount of operating equipment is required aboveground; therefore, risks stemming from normal construction activities are minimal.

Transportation To/From the Sites

Transportation of the oil to and from the storage caverns could result in the following types of environmental consequences:

1. Hydrology. The potential impact on water quality arises from three sources: (a) dredging that may be required to enlarge the Gulf Coast port facilities that will be used in the program; (b) oil spills that may occur during vessel collisions brought about because of increased traffic of petroleum-carrying ships; and (c) the need to dispose of oily ballast.

Unless otherwise adequately controlled, the environmental effects of dredging can be significant. A large portion of the physical, chemical, and biological pollutants discharged into waterways end up as bottom deposits. Dredging resuspends and redeposits these materials, which can be temporarily harmful if they contain unusually large amounts of pesticides or other organics, radionuclides, heavy metals, or viruses. Specifically, problems can arise when bottom materials are made up of large quantities of unoxidized or partially oxidized organic material where deposits have high percentages of petroleum or petrochemical derivatives or where high nutrient levels exist in the bottom deposits because these materials require large amounts of oxygen from the water for oxidation. Bottom materials of no commercial value may be used for fill in salt marsh lands. This practice can degrade water quality in the vicinity of the disposal site and reduce the productivity of the marsh lands. However, the fill may provide additional land.

To minimize the adverse impacts associated with any required dredging, all safeguards and procedures necessary to obtain a permit from the Army Corps of Engineers will be implemented. The Corps applies criteria established by the U.S. Environmental Protection Agency (EPA) in ruling on permit applications. Discharge of polluted material in the ocean will not be permitted if evidence exists that the proposed disposal might have an unacceptable adverse impact on municipal water supplies, shellfish beds, wildlife, fisheries, or recreational areas. For specific pollutants (heavy metals, nitrates, total organic carbon, and others, EPA's standards require that the resulting concentration not exceed 1.5 times that of the receiving waters. It is common for the Corps to require monitoring as a condition of the permit.

Potential consequences of oil spills will be minimized through strict adherence to the spill-prevention techniques required by the Federal Water Pollution Control Act Amendments, and through the development of oil-spill contingency plans to contain and recover spilled oil effectively.

The need to dispose of oily ballast will arise when the ships used to transport the oil from the storage site to the refinery arrive at the dock. These ships would have taken on a relatively small amount of sea water as ballast when they were last emptied of oil. That water must be removed and disposed of before the stored oil can be loaded. Since the ballast will contain a small amount of suspended oil, adequate treatment facilities, including surge tanks, will be required at each of the docks used when transporting the oil from storage. Properly treated ballast can then be disposed of in the Gulf.

2. Biology. Both dredging and oil spills could impact on the biological environment. Dredging removes the substrata on which some fauna critical to the food chain depend. The resuspension of sediments can increase the turbidity in the vicinity of the dredging operations to a point where light penetration is reduced and photosynthesis and species production temporarily decrease. The redeposition of the suspended sediments could also bury highly productive grass flats or oyster reefs unless the deposition site is carefully defined. In addition, dredging which connects waterways may change salinity levels in waterways and adjacent marshlands, with potentially adverse effects on local species and habitats.

Those organisms most severely affected by a major oil spill are water birds. Plankton also appear to be quite sensitive to oil pollution. Bottom organisms are affected primarily by the deposition of oily bottom sludges. However, repopulation by benthic organisms is, in many cases, surprisingly rapid. Fish appear to be able to avoid serious damage simply by moving away. However, since the presence of small quantities of dissolved petroleum compounds might possibly interfere with normal migratory movements of fish, a major spill might have immediate consequences for fisheries.

These biological impacts would be minimized through the implementation of those control measures outlined in the above discussion on hydrology.

Filling and Maintenance

This activity involves filling the storage caverns with oil, thus displacing the brine currently there, and performing the tasks required to ensure that the storage site is properly maintained and secured. These activities could result in the following types of environmental consequences:

1. Hydrology. The potential impact on water quality and quantity arises from brine disposal. It is anticipated that some of the brine now in the existing caverns (or which would be generated in any limited cavern-modification effort) will be used by chemical plants as feedstock thus, would not result in an environmental impact. Any brine not so used would be disposed of by deep well injection into a saline aquifer. This is a long-established practice used by the petroleum industry in the Gulf Coast region.

Multiple, large saline aquifers exist in the Gulf Coast region, with ample capacity for underground injection of the quantities of brine contemplated. However, there are physical limitations to the rate at which brine can be injected into a well. To achieve the necessary injection rates without fracturing geologic strata that contain fresh water, brine is customarily disposed of in multiple wells at a rate of 1,000 gallons or less per minute. Therefore, the number of disposal wells that would need to be drilled for a particular site would depend on the capacity of the cavern. Moreover, these brine injection wells have to be spaced around the cavern surface so that they will not interfere with one another. Brine injection could force saline water into fresh water aquifers by fracturing the rock formation or migration along existing fractures or fault zones, and increase the surface discharge from saline springs. In addition, during injection, the brine must be maintained in an oxygen-free atmosphere to prevent the growth of bacteria that could cause the formation of metal oxide precipitates, which, in turn, could clog the wells. These consequences can probably be avoided through proper well design, construction, and operation.

2. Noise. Displacing brine with oil will generate noise that may have an impact on wildlife habitats in the immediate vicinity. The noise source will be the operation

of pumps and electric motors and could have an impact on human activity up to 3,500 feet from the site. These noise emissions can be substantially reduced through acoustical treatment, such as insulation.

3. Employment. The operations staff of each salt dome storage facility will consist of only 20 to 25 workers, who will perform the necessary security and maintenance functions. The 25 operations and maintenance personnel at a 90-million-barrel salt dome storage facility would generate employment for an additional 22 workers, resulting in a total employment impact of 47 persons.

4. Regional Economic Activity. The operation and maintenance of a salt dome storage facility would have a small impact on the regional economy. For a 90-million-barrel facility, this could amount to $2.34 million per year.

Use of the Reserve

Should a supply interruption occur and the ESR be activated, the stored reserve would be removed from the caverns by displacing the oil with water. This activity could result in the following types of environmental consequences:

1. Hydrology. Because of the large volumes involved, nearly all of the required water will be drawn from surface water sources rather than from groundwater. Groundwater will be used only when the resultant brine in the cavern can be cycled to chemical plants and when the available surface water does not meet the water-quality standards for chemical plant feedstock brine. However, where brine is not cycled to a chemical plant and large volumes of water are required to displace the oil, surface water might be obtained from the Gulf of Mexico, the Mississippi River, or other nearby bodies of water.

Furthermore, the multiple fillings and withdrawals from using the reserve could create the need for brine treatment facilities. The brine displaced during second and subsequent fillings would contain small amounts of suspended oil that would need to be removed before the brine could be used as chemical plant feedstock. However, no treatment is anticipated for that portion of the brine that may undergo injection-well disposal, inasmuch as the injection salaquifers will remain completely isolated from the surrounding biosphere.

2. Geology. If it became necessary to use groundwater to some degree, some subsidence could occur in the areas of groundwater withdrawal. The amount would depend principally on the decline in hydrostatic pressure and the amount of clay present in the lithic sequence affected by the decline. Furthermore, the timeframe for this subsidence would depend on the thickness and hydraulic character of the clay beds, which undergo compaction. This effect can be minimized through careful selection of the aquifers and the rates of withdrawal.

In addition, some geological impact may result from multiple fillings and withdrawals of the caverns. Each time the cavern is emptied of oil through water displacement additional leaching occurs, thereby increasing the volume of the cavern. The stability (i.e., susceptibility to cavern shrinkage or salt "creep") of an individual cavern depends in large measure on the cavern size and shape and the mass of the salt dome and the overburden. As a cavern's size increases because of oil/water cycling, the phenomenon of salt "creep" toward an equilibrium state of stress may be manifested by very slight subsidence and by a change in the shape of the cavern. However, sufficient knowledge of technology and operating experience with construction of salt caverns, specifically concurrent fill and leaching, are available to control these factors, and to ensure stability of the projected cavern configurations.

3. Biology. The impingment and entrainment of aquatic biota will be unavoidable when using water from the Gulf of Mexico. However, the impact will be minimized by designing intake rates to conform to environmental restrictions that require intake velocities of less than 0.5 feet per second. Furthermore, the intake valves can be positioned sufficiently far from the shore so that estuaries are avoided; thus fewer biota are affected.

4. Noise. The displacement of the oil with water will generate noise that may have an impact on wildlife habitats in the immediate vicinity. These impacts are discussed in detail in the subsection on noise under "Filling and Maintenance," on page VII-7.

EXISTING MINES

Part of the ESR will probably be stored in existing mines. The sites under consideration include both operating and abandoned mines and are located in various types of geological formations, including rock salt.

In general, fewer potential environmental consequences are associated with storing oil in existing mines than with solution-mined salt caverns. Those consequences include:

1. Geology. Although an underground location is less susceptible to earthquake damage than an aboveground structure, the remote hazard of facility failure from seismic disturbances does exist in the case of mines in rock formations. This hazard can be essentially eliminated by selecting mines in zones of seismic quiescence. Because of the inherent stability of salt domes, there is virtually no risk of earthquake damage to the salt mines under consideration.

2. Hydrology. The water-related impacts of existing-mine use are, in all cases, substantially less than those of solution-cavern use. Substantial amounts of water will not be needed to displace the oil when cycling the reserve because the oil would be pumped out with surface-powered pumps. In addition, since the mines will be empty before filling, there will be no brine to dispose of. However, the one water-related impact to be addressed is the seepage of groundwater from surrounding rock formations where some permeability exists in the host rock. In such mines, the outflow of oil will be prevented by maintaining either natural or artificial hydraulic gradients so that the hydrostatic pressures in the host rock are higher than the internal pressure of the oil. This method of containment results in seepage of groundwater into the storage cavern. This water and the intentionally provided waterbed below the oil must be removed and treated during both conversion and operation of the facility. The various pollutants that contaminate this water must be removed if the effluent is to be environmentally acceptable. Treatment options include existing refinery and municipal wastewater treatment facilities, if they are easily accessible to the storage sites. Where no such facilities are available, on-site package treatment facilities will be provided.

3. Biology. The impact of mine storage on animal habitat should be somewhat less than the impact of solution-mine salt caverns for, although the disturbance created by the construction should be comparable, the nature of the activity and its duration will be significantly less. Further, the impact of converting abandoned mines should be substantially less than that of converting operating mines because less construction will be required over a shorter period, and even less area will be needed for the facility.

4. Air Quality. The fugitive-dust problem associated with the conversion and operation of solution-mined salt caverns is applicable here as well, except that the effects will be substantially less for abandoned mines because of the lower level of required activity.

5. Noise. The level of noise generated by the construction phase of converting operating mines will depend largely on the extent of the construction required, although the area of influence should not exceed that for salt caverns (i.e.,1,500 feet from the site). The noise generated by abandoned-mine conversion should be substantially less. Cycling the oil will require large pumps similar to those used for displacing the oil in salt caverns, but the distance at which noise emissions will impact on human activity should be less for a particular site than the projected 3,500 feet for salt caverns because fewer pumps and motors will be required.

6. Land Use. Land-use impacts will, in general, be less for converting existing mines than for converting existing solution-mined salt caverns since no land is required for the construction of injection wells. In the case of converting operating mines, which involves the relocation of mining operations, some land will be required to construct new access shafts and possibly relocate surface facilities for the new mine. Land for the new mine and facilities could require from 10 to 50 or more acres. Abandoned mines will require only a few acres around the access shafts to locate the surface facilities associated with the storage site. Depending on the distribution system of each mine, a pipeline right-of-way may be required.

7. Employment. The number of workers required to convert an underground mine to an oil storage facility will vary, depending on the size and condition of the mine. A 90-million-barrel operating mine would probably employ about 120 workmen for conversion and relocation of existing mining activities. Another 792 persons would be employed as an indirect consequence of the project, to provide services to the construction workers or to manufacture equipment and supplies. Thus, an estimated 902 persons would be employed directly or indirectly as a result of storing 90 million barrels of oil in an existing mine.

A second potential employment impact associated with converting an operating mine involves the work force of the mine. If the mining operation were to cease, the workers would have to find other jobs. If the mine were relocated, the workers could be employed initially for conversion and relocation, and subsequently, in the relocated mining operation.

8. Regional Economic Activity. Conversion of an existing mine to an oil storage facility would have a small impact on the regional economy. The total direct expenditure of $9.52 million per year required for a 90-million-barrel facility would result in a regional economic impact of $26.7 million per year. This economic effect translates into a total increase in personal income of $7.23 million per year.

9. Taxes. The revenues generated by the project will result from the taxes paid in the course of doing business (e.g., excise and sales taxes) and from increased household income (income taxes and sales or property taxes resulting from increased household spending). Thus, the yearly taxes associated with this storage alternative are very low: federal, $1.90 million; state, $0.21 million; local, $0.09 million.

It is expected that the Federal Government will own all storage facilities in existing mines, making these properties exempt from local taxes. However, if the current owner were relocated, the new mine would contribute to the local tax base, offsetting the loss of revenues from the old mine.

NEW SOLUTION-MINED SALT CAVERNS

Should it become necessary to develop new solution-mined salt caverns to store part of the ESR, only facility construction and preparation would differ significantly from the same activity in converting and using existing solution-mined salt caverns. Specifically, constructing and preparing new solution-mined salt caverns could have the following types of environmental consequences:

1. Hydrology. The development of new salt caverns by solution mining requires both the use and the disposal of much larger quantities of water than required in the conversion and preparation of existing caverns. It is anticipated that this water could be obtained primarily from the Gulf of Mexico, and that the brine produced by the mining operating would be disposed of in the Gulf. Should the technique of concurrent leaching and filling be used, the resultant brine might include a small amount of

suspended oil and would therefore require treatment (separation) prior to disposal. Treatment of brine, other than for oil suspension, is not anticipated at this time, based on known compositions of Gulf Coast salt domes. If industry created the new solution-mined caverns, they might use, after treatment, some of the brine in their chemical plants, thereby reducing disposal problems.

Disposing of the brine in the Gulf of Mexico would increase salinity concentration in the area of the diffuser. The size of the affected area would depend on the rate at which the brine was disposed. For purposes of studying the potential impact, a "worst-case" analysis was conducted. The results show that, if a new cavern development produced brine at a rate of 42,000 gallons per minute and this brine were deposited in the Gulf at a velocity of 3 feet per second, detectable change might occur over 2,076 acres. Behavioral changes (primarily avoidance) in mobile species and possible death in sessile species might be encountered in a much smaller area--e.g., about 226 acres. Placing the diffuser at a sufficient distance from the shore and positioning it to avoid banks, reefs, and tidal inlets would restrict the adverse impact to the immediate vicinity of the diffuser.

2. Land Use. The impact on land use would be greater for new solution-mined caverns than for existing ones because, except for petroleum production, no part of the land on or near the salt dome would have been developed previously. It is estimated that a maximum surface area of 260 acres would be required for each site. All surface and other support facilities would have to be constructed, although the impacts associated with this construction would be minor. The most significant impact would be the use of existing roads or construction of new roads for movement of equipment to and from the site, and the construction of new pipelines to connect the storage site with existing transportation systems. Land-use activities such as housing would be limited to outside the boundary lines.

3. Employment. Approximately 150 persons would be employed for 3 to 5 years to construct a new solution-mined salt cavern with a capacity of 200 million barrels. This construction activity would generate secondary employment of 1,277 persons in the service and manufacturing sectors. Most of this impact would be felt in the Gulf region where there is ample labor and materials manufacturing to carry out this program.

4. Regional Economic Activity. Construction of a new solution-mined storage facility would have a much greater impact on the regional economy than conversion of existing facilities would. Depending on the direct expenditure required, the regional economic impact could range from $48.3 million to $155.0 million per year. This translates into an annual increase in personal income of $13.1 million to $42.0 million.

5. Time-related impacts. Conversion of existing caverns will require 1 to 2 years while construction of new caverns would require 3 to 5 years. Certain conditions which could develop potential impacts discussed under existing caverns above will have the same impact for new caverns if they are considered on a per unit-of-time basis. However, since new caverns will take longer to develop, related impacts are expected to be more significant, with respect to time, than for conversion of existing caverns. The types of impacts are discussed in the existing cavern discussion (biology, air quality, and noise).

MARKET IMPACTS

AGGREGATE ECONOMIC IMPACTS

Implementation of the ESR Plan is not expected to result in significant impacts to the nation's economy, according to preliminary analyses conducted within the FEA. A brief summary of these conclusions as they relate to international trade, the GNP, inflation, the federal budget, petroleum markets, and the petroleum industry is presented below.

International Trade

The Early Storage Reserve will result in increased imports about equal in volume to the amount stored, because the oil removed from the market and stored would be replaced by increased imports. This will increase total annual imports by about $1 billion in both FY 77 (starting about January 1977) and FY 78. This increase is approximately 1 percent of the annual imports of all goods and services and less than 0.1 percent of the GNP. Experience with increased foreign exchange payments for oil since 1973 have indicated that they are likely to merge with other international trade adjustments and tend to contribute to counterbalancing increases in U.S. exports or capital inflows.

Employment, Expenditures and GNP

In general, the effect on national employment and GNP will be positive but not significant, although the impact on the immediate locality where storage facilities are located may be appreciable as noted in the regional economic impacts discussions.

Specific effects of the ESR program on aggregate national employment and GNP will depend on the condition of markets for relevant labor categories and materials during the period of engineering construction and fill. To the extent that there is under-employment in the relevant engineering, construction and equipment categories, the program will tend to add to employment and production in those sectors. This result will also depend on there being no significant capacity limitations on the supply of materials and equipment for use in the program. On the other hand, if the general availability of labor or materials is limited or if the program is financed by cutting back other spending programs, it will divert resources from other uses and not add to employment or GNP. It appears, at present, that availability of some skilled labor categories, such as field welders, may be limited, but this would not prevent achievement of the planned schedule. No serious limitations on most materials are anticipated.

Apart from oil acquisition, most of the program's cost will be for engineering and construction connected with storage facilities. The labor required will be negligible in relation to the national labor force, even in the critical skill categories. It is expected that expenditures for facilities will have little effect in a context of total national fixed investment in the range of $200 billion per year.

Inflationary Impact

The President's FY 77 budget projections show unemployment continuing at high rates throughout the ESR period. Therefore, the ESR will place no significant pressure on the total labor market but will have a positive, though small, effect on employment if other programs are not reduced. There might be small inflationary pressures on highly specialized labor categories (e.g., oil-field welders) in which there is currently no unemployment. The program will use significant amounts of oil-field pipe and equipment, which are not expected to be in short supply.

The program will not affect the productivity or structural character of the oil importing and refining industries. The direct price effects as a result of the 150 million barrel ESR program would be small. For instance, purchase at import prices of the 150 million barrels of oil for storage would raise the national average price about 3¢ per barrel or 0.07¢ per gallon. Significant indirect price effects are not anticipated.

FIGURE VII-1

POTENTIAL ENVIRONMENTAL IMPACTS OF SOLUTION CAVERN STORAGE
(EXISTING CAVERNS)

TYPES OF IMPACT / ACTIVITY	HYDROLOGY-WATER QUALITY & WATER SUPPLY	GEOLOGY	BIOLOGY	AIR QUALITY	NOISE	LAND USE	EMPLOYMENT	REGIONAL ECONOMIC ACTIVITY	TAXES	PUBLIC SAFETY
Facility Conversion and Preparation	Underground disposal of brine		disturbance and migration of local animal populations	fugitive dust emissions; can be controlled by wetting	disturbance of local residents within 1500'	construction of support facilities and feeder pipelines	maximum of 76 workers per site at any one time for 1-2 years	regional economic impact of $69.4MM per year, per site; increase in personal income of $18.8MM per year per site	small increase in tax revenues, except small decrease in property tax revenues if sites are government owned	minimal impact
Transportation	dredging effects; disposal of dredge spoil; oil spills; disposal of oily ballast		adverse impacts on aquatic organisms							
Filling and Maintaining	underground disposal of brine				disturbance of local residents within 3500'		small permanent security and maintenance crew	regional economic impact of $2.34MM per year per site		
Using the Reserve	underground disposal of brine	subsidence; change in size and shape of cavern	adverse impacts on aquatic organisms		disturbance of local residents within 3500'					

APPENDIX A

LEGISLATION

The Energy Policy and Conservation Act of 1975, P.L. 94-163, encompasses several energy and conservation areas. Title I, Part B, pertains to the Strategic Petroleum Reserve. In addition, Sec. 2. Statement of Purposes, and Sec. 3. Definitions are reproduced in this report for easy reference.

STATEMENT OF PURPOSES

42 USC 6201. Sec. 2. The purposes of this Act are—

(1) to grant specific standby authority to the President, subject to congressional review, to impose rationing, to reduce demand for energy through the implementation of energy conservation plans, and to fulfill obligations of the United States under the international energy program;

(2) to provide for the creation of a Strategic Petroleum Reserve capable of reducing the impact of severe energy supply interruptions;

(3) to increase the supply of fossil fuels in the United States, through price incentives and production requirements;

(4) to conserve energy supplies through energy conservation programs, and, where necessary, the regulation of certain energy uses;

(5) to provide for improved energy efficiency of motor vehicles, major appliances, and certain other consumer products;

(6) to reduce the demand for petroleum products and natural gas through programs designed to provide greater availability and use of this Nation's abundant coal resources; and

(7) to provide a means for verification of energy data to assure the reliability of energy data.

DEFINITIONS

42 USC 6202. Sec. 3. As used in this Act:

(1) The term "Administrator" means the Administrator of the Federal Energy Administration.

(2) The term "person" includes (A) any individual, (B) any corporation, company, association, firm, partnership, society, trust, joint venture, or joint stock company, and (C) the government and any agency of the United States or any State or political subdivision thereof.

(3) The term "petroleum product" means crude oil, residual fuel oil, or any refined petroleum product (including any natural liquid and any natural gas liquid product).

(4) The term "State" means a State, the District of Columbia, Puerto Rico, or any territory or possession of the United States.

(5) The term "United States" when used in the geographical sense means all of the States and the Outer Continental Shelf.

(6) The term "Outer Continental Shelf" has the same meaning as such term has under section 2 of the Outer Continental Shelf Lands Act (43 U.S.C. 1331).

(7) The term "international energy program" means the Agreement on an International Energy Program, signed by the United States on November 18, 1974, including (A) the annex entitled "Emergency Reserves", (B) any amendment to such Agreement which includes another nation as a party to such Agreement, and (C) any technical or clerical amendment to such Agreement.

(8) The term "severe energy supply interruption" means a national energy supply shortage which the President determines—

(A) is, or is likely to be, of significant scope and duration, and of an emergency nature;

(B) may cause major adverse impact on national safety or the national economy; and

(C) results, or is likely to result, from an interruption in the supply of imported petroleum products, or from sabotage or an act of God.

(9) The term "antitrust laws" includes—

(A) the Act entitled "An Act to protect trade and commerce against unlawful restraints and monopolies", approved July 2, 1890 (15 U.S.C. 1, et seq.);

(B) the Act entitled "An Act to supplement existing laws against unlawful restraints and monopolies, and for other purposes", approved October 15, 1914 (15 U.S.C. 12, et seq.);

(C) the Federal Trade Commission Act (15 U.S.C. 41, et seq.);

(D) sections 73 and 74 of the Act entitled "An Act to reduce taxation, to provide revenue for the Government, and for other purpose", approved August 27, 1894 (15 U.S.C. 8 and 9); and

(E) the Act of June 19, 1936, chapter 592 (15 U.S.C. 13, 13a, 13b, and 21A).

(10) The term "Federal land" means all lands owned or controlled by the United States, including the Outer Continental Shelf, and any land in which the United States has reserved mineral interests, except lands—

(A) held in trust for Indians or Alaska Natives,

(B) owned by Indians or Alaska Natives with Federal restrictions on the title,

(C) within any area of the National Park System, the National Wildlife Refuge System, the National Wilderness Preservation System, the National System of Trails, or the Wild and Scenic Rivers System, or

(D) within military reservations.

PART B—STRATEGIC PETROLEUM RESERVE

10 USC 7421 et seq.

DECLARATION OF POLICY

SEC. 151. (a) The Congress finds that the storage of substantial quantities of petroleum products will diminish the vulnerability of the United States to the effects of a severe energy supply interruption, and provide limited protection from the short-term consequences of interruptions in supplies of petroleum products. 42 USC 6231.

(b) It is hereby declared to be the policy of the United States to provide for the creation of a Strategic Petroleum Reserve for the storage of up to 1 billion barrels of petroleum products, but not less than 150 million barrels of petroleum products by the end of the 3-year period which begins on the date of enactment of this Act, for the purpose of reducing the impact of disruptions in supplies of petroleum products or to carry out obligations of the United States under the international energy program. It is further declared to be the policy of the United States to provide for the creation of an Early Storage Reserve, as part of the Reserve, for the purpose of providing limited protection from the impact of near-term disruptions in supplies of petroleum products or to carry out obligations of the United States under the international energy program.

DEFINITIONS

42 USC 6232. Sec. 152. As used in this part:

(1) The term "Early Storage Reserve" means that portion of the Strategic Petroleum Reserve which consists of petroleum products stored pursuant to section 155.

(2) The term "importer" means any person who owns, at the first place of storage, any petroleum product imported into the United States.

(3) The term "Industrial Petroleum Reserve" means that portion of the Strategic Petroleum Reserve which consists of petroleum products owned by importers or refiners and acquired, stored, or maintained pursuant to section 156.

(4) The term "interest in land" means any ownership or possessory right with respect to real property, including ownership in fee, an easement, a leasehold, and any subsurface or mineral rights.

(5) The term "readily available inventories" means stocks and supplies of petroleum products which can be distributed or used without affecting the ability of the importer or refiner to operate at normal capacity; such term does not include minimum working inventories or other unavailable stocks.

(6) The term "refiner" means any person who owns, operates, or controls the operation of any refinery.

(7) The term "Regional Petroleum Reserve" means that portion of the Strategic Petroleum Reserve which consists of petroleum products stored pursuant to section 157.

(8) The term "related facility" means any necessary appurtenance to a storage facility, including pipelines, roadways, reservoirs, and salt brine lines.

(9) The term "Reserve" means the Strategic Petroleum Reserve.

(10) The term "storage facility" means any facility or geological formation which is capable of storing significant quantities of petroleum products.

(11) The term "Strategic Petroleum Reserve" means petroleum products stored in storage facilities pursuant to this part; such term includes the Industrial Petroleum Reserve, the Early Storage Reserve, and the Regional Petroleum Reserve.

STRATEGIC PETROLEUM RESERVE OFFICE

Establishment. 42 USC 6233. Sec. 153. There is established, in the Federal Energy Administration, a Strategic Petroleum Reserve Office. The Administrator, acting through such Office and in accordance with this part, shall exercise authority over the establishment, management, and maintenance of the Reserve.

STRATEGIC PETROLEUM RESERVE

42 USC 6234. Sec. 154. (a) A Strategic Petroleum Reserve for the storage of up to 1 billion barrels of petroleum products shall be created pursuant to this part. By the end of the 3-year period which begins on the date of enactment of this Act, the Strategic Petroleum Reserve (or the Early Storage Reserve authorized by section 155, if no Strategic Petroleum Reserve Plan has become effective pursuant to the provisions of section 159(a)) shall contain not less than 150 million barrels of petroleum products.

Plan to Congress. Post, p. 965. (b) The Administrator, not later than December 15, 1976, shall prepare and transmit to the Congress, in accordance with section 551, a

Strategic Petroleum Reserve Plan. Such Plan shall comply with the provisions of this section and shall detail the Administrator's proposals for designing, constructing, and filling the storage and related facilities of the Reserve.

(c) (1) To the maximum extent practicable and except to the extent that any change in the storage schedule is justified pursuant to subsection (e) (6), the Strategic Petroleum Reserve Plan shall provide that:

(A) within 7 years after the date of enactment of this Act, the volume of crude oil stored in the Reserve shall equal the total volume of crude oil which was imported into the United States during the base period specified in paragraph (2);

(B) within 18 months after the date of enactment of this Act, the volume of crude oil stored in the Reserve shall equal not less than 10 percent of the goal specified in subparagraph (A);

(C) within 3 years after the date of enactment of this Act, the volume of crude oil stored in the Reserve shall equal not less than 25 percent of the goal specified in subparagraph (A); and

(D) within 5 years after the date of enactment of this Act, the volume of crude oil stored in the Reserve shall equal not less than 65 percent of the goal specified in subparagraph (A).

Volumes of crude oil initially stored in the Early Storage Reserve and volumes of crude oil stored in the Industrial Petroleum Reserve, and the Regional Petroleum Reserve shall be credited toward attainment of the storage goals specified in this subsection.

(2) The base period shall be the period of the 3 consecutive months, during the 24-month period preceding the date of enactment of this Act, in which average monthly import levels were the highest.

(d) The Strategic Petroleum Reserve Plan shall be designed to assure, to the maximum extent practicable, that the Reserve will minimize the impact of any interruption or reduction in imports of refined petroleum products and residual fuel oil in any region which the Administrator determines is, or is likely to become, dependent upon such imports for a substantial portion of the total energy requirements of such region. The Strategic Petroleum Reserve Plan shall be designed to assure, to the maximum extent practicable, that each noncontiguous area of the United States which does not have overland access to domestic crude oil production has its component of the Strategic Petroleum Reserve within its respective territory.

(e) The Strategic Petroleum Reserve Plan shall include:

(1) a comprehensive environmental assessment;

(2) a description of the type and proposed location of each storage facility (other than storage facilities of the Industrial Petroleum Reserve) proposed to be included in the Reserve;

(3) a statement as to the proximity of each such storage facility to related facilities;

(4) an estimate of the volumes and types of petroleum products proposed to be stored in each such storage facility;

(5) a projection as to the aggregate size of the Reserve, including a statement as to the most economically-efficient storage levels for each such storage facility;

(6) a justification for any changes, with respect to volumes or dates, proposed in the storage schedule specified in subsection (c), and a program schedule for overall development and completion of the Reserve (taking into account all relevant factors, including cost effectiveness, the need to construct related facilities, and the ability to obtain sufficient quantities of petroleum products to fill the storage facilities to the proposed storage levels);

(7) an estimate of the direct cost of the Reserve, including—

(A) the cost of storage facilities;

(B) the cost of the petroleum products to be stored;

(C) the cost of related facilities; and

(D) management and operation costs;

(8) an evaluation of the impact of developing the Reserve, taking into account—

(A) the availability and the price of supplies and equipment and the effect, if any, upon domestic production of acquiring such supplies and equipment for the Reserve;

(B) any fluctuations in world, and domestic, market prices for petroleum products which may result from the acquisition of substantial quantities of petroleum products for the Reserve;

(C) the extent to which such acquisition may support otherwise declining market prices for such products; and

(D) the extent to which such acquisition will affect competition in the petroleum industry;

(9) an identification of the ownership of each storage and related facility proposed to be included in the Reserve (other than storage and related facilities of the Industrial Petroleum Reserve);

(10) an identification of the ownership of the petroleum products to be stored in the Reserve in any case where such products are not owned by the United States;

(11) a statement of the manner in which the provisions of this part relating to the establishment of the Industrial Petroleum Reserve and the Regional Petroleum Reserve will be implemented; and

(12) a Distribution Plan setting forth the method of drawdown and distribution of the Reserve.

EARLY STORAGE RESERVE

42 USC 6235.

SEC. 155. (a)(1) The Administrator shall establish an Early Storage Reserve as part of the Strategic Petroleum Reserve. The Early Storage Reserve shall be designed to store petroleum products, to the maximum extent practicable, in existing storage capacity. Petroleum products stored in the Early Storage Reserve may be owned by the United States or may be owned by others and stored pursuant to section 156(b).

(2) If the Strategic Petroleum Reserve Plan has not become effective under section 159(a), the Early Storage Reserve shall contain not less than 150 million barrels of petroleum products by the end of the 3-year period which begins on the date of enactment of this Act.

(b) The Early Storage Reserve shall provide for meeting regional needs for residual fuel oil and refined petroleum products in any region which the Administrator determines is, or is likely to become, dependent upon imports of such oil or products for a substantial portion of the total energy requirements of such region.

Plan, transmittal to Congress.

(c) Within 90 days after the date of enactment of this Act, the Administrator shall prepare and transmit to the Congress an Early Storage Reserve Plan which shall provide for the storage of not less than 150 million barrels of petroleum products by the end of 3 years from the date of enactment of this Act. Such plan shall detail the Administrator's proposals for implementing the Early Storage Reserve requirements of this section. The Early Storage Reserve Plan shall, to the maximum extent practicable, provide for, and set forth the manner in which, Early Storage Reserve facilities will be incorporated into the Strategic Petroleum Reserve after the Strategic Petroleum Reserve Plan has become effective under section 159(a). The Early Storage Reserve Plan shall include, with respect to the Early Storage Reserve, the same or similar assessments, statements, estimates, evaluations, projections, and other information which section 154(e) requires to be included in the Strategic Petroleum Reserve Plan, including a Distribution Plan for the Early Storage Reserve.

INDUSTRIAL PETROLEUM RESERVE

Establishment. 42 USC 6236.

SEC. 156. (a) The Administrator may establish an Industrial Petroleum Reserve as part of the Strategic Petroleum Reserve.

(b) To implement the Early Storage Reserve Plan or the Strategic Petroleum Reserve Plan which has taken effect pursuant to section 159(a), the Administrator may require each importer of petroleum products and each refiner to (1) acquire, and (2) store and maintain in readily available inventories, petroleum products in amounts determined by the Administrator, except that the Administrator may not require any such importer or refiner to store such petroleum products in an amount greater than 3 percent of the amount imported or refined by such person, as the case may be, during the previous calendar year. Petroleum products imported and stored in the Industrial Petroleum Reserve shall be exempt from any tariff or import license fee.

(c) The Administrator shall implement this section in a manner which is appropriate to the maintenance of an economically sound and competitive petroleum industry. The Administrator shall take such steps as are necessary to avoid inequitable economic impacts on refiners and importers, and he may grant relief to any refiner or importer who would otherwise incur special hardship, inequity, or unfair distribution of burdens as the result of any rule, regulation, or order promulgated under this section. Such relief may include full or partial exemption from any such rule, regulation, or order and the issuance of an order permitting such an importer or refiner to store petroleum products owned by such importer or refiner in surplus storage capacity owned by the United States.

REGIONAL PETROLEUM RESERVE

42 USC 6237.

SEC. 157. (a) The Strategic Petroleum Reserve Plan shall provide for the establishment and maintenance of a Regional Petroleum Reserve in, or readily accessible to, each Federal Energy Administration Region, as defined in title 10, Code of Federal Regulations in effect on November 1, 1975, in which imports of residual fuel oil or any refined petroleum product, during the 24-month period preceding the date of computation, equal more than 20 percent of demand for such oil or product in such regions during such period, as determined by the Administrator. Such volume shall be computed annually.

(b) To implement the Strategic Petroleum Reserve Plan, the Administrator shall accumulate and maintain in or near any such Federal Energy Administration Region described in subsection (a), a Regional Petroleum Reserve containing volumes of such oil or product, described in subsection (a), at a level adequate to provide substantial protection against an interruption or reduction in imports of such oil or product to such region, except that the level of any such Regional Petroleum Reserve shall not exceed the aggregate volume of imports of such oil or product into such region during the period of the 3 consecutive months, during the 24-month period specified in subsection (a), in which average monthly import levels were the highest, as determined by the Administrator. Such volume shall be computed annually.

(c) The Administrator may place in storage crude oil, residual fuel oil, or any refined petroleum product in substitution for all or part of the volume of residual fuel oil or any refined petroleum product stored in any Regional Petroleum Reserve pursuant to the provisions of this section if he finds that such substitution (1) is necessary or desirable for purposes of economy, efficiency, or for other reasons, and (2) may be made without delaying or otherwise adversely affecting the fulfillment of the purpose of the Regional Petroleum Reserve.

OTHER STORAGE RESERVES

Report to Congress. 42 USC 6238.

SEC. 158. Within 6 months after the Strategic Petroleum Reserve Plan is transmitted to the Congress, pursuant to the requirements of section 154(b), the Administrator shall prepare and transmit to the Congress a report setting forth his recommendations concerning the necessity for, and feasibility of, establishing—

(1) Utility Reserves containing coal, residual fuel oil, and refined petroleum products, to be established and maintained by major fossil-fuel-fired baseload electric power generating stations;

(2) Coal Reserves to consist of (A) federally-owned coal which is mined by or for the United States from Federal lands, and (B) Federal lands from which coal could be produced with minimum delay; and

(3) Remote Crude Oil and Natural Gas Reserves consisting of crude oil and natural gas to be acquired and stored by the United States, in place, pursuant to a contract or other agreement or arrangement entered into between the United States and persons who discovered such oil or gas in remote areas.

REVIEW BY CONGRESS AND IMPLEMENTATION

42 USC 6239.

SEC. 159. (a) The Strategic Petroleum Reserve Plan shall not become effective and may not be implemented, unless—

(1) the Administrator has transmitted such Plan to the Congress pursuant to section 154(b); and

(2) neither House of Congress has disapproved (or both Houses have approved) such Plan, in accordance with the procedures specified in section 551.

(b) For purposes of congressional review of the Strategic Petroleum Reserve Plan under subsection (a), the 5 calendar days described in section 551(f)(4)(A) shall be lengthened to 15 calendar days, and the 15 calendar days described in section 551 (c) and (d) shall be lengthened to 45 calendar days.

Post, p. 965.

(c) The Administrator may, prior to transmittal of the Strategic Petroleum Reserve Plan, prepare and transmit to the Congress proposals for designing, constructing, and filling storage or related facilities. Any such proposal shall be accompanied by a statement explaining (1) the need for action on such proposals prior to completion of such Plan, (2) the anticipated role of the proposed storage or related facilities in such Plan, and (3) to the maximum extent practicable, the same or similar assessments, statements, estimates, evaluations, projections, and other information which section 154(e) requires to be included in the Strategic Petroleum Reserve Plan.

(d) The Administrator may prepare amendments to the Strategic Petroleum Reserve Plan or to the Early Storage Reserve Plan. He shall transmit any such amendment to the Congress together with a statement explaining the need for such amendment and, to the maximum extent practicable, the same or similar assessments, statements, estimates, evaluations, projections, and other information which section 154(e) requires to be included in the Strategic Petroleum Reserve Plan.

(e) Any proposal transmitted under subsection (c) and any amendment transmitted under subsection (d), other than a technical or clerical amendment or an amendment to the Early Storage Reserve Plan, shall not become effective and may not be implemented unless—

(1) the Administrator has transmitted such proposal or amendment to the Congress in accordance with subsection (c) or (d) (as the case may be), and

(2) neither House of Congress has disapproved (or both Houses of Congress have approved) such proposal or amendment, in accordance with the procedures specified in section 551.

(f) To the extent necessary or appropriate to implement—

(1) the Strategic Petroleum Reserve Plan which has taken effect pursuant to subsection (a);

(2) the Early Storage Reserve Plan;

(3) any proposal described in subsection (c), or any amendment described in subsection (d), which such proposal or amendment has taken effect pursuant to subsection (e); and

(4) any technical or clerical amendment or any amendment to the Early Storage Reserve Plan,

the Administrator may:

(A) promulgate rules, regulations, or orders;

(B) acquire by purchase, condemnation, or otherwise, land or interests in land for the location of storage and related facilities;

(C) construct, purchase, lease, or otherwise acquire storage and related facilities;

(D) use, lease, maintain, sell, or otherwise dispose of storage and related facilities acquired pursuant to this part;

(E) acquire, subject to the provisions of section 160, by purchase, exchange, or otherwise, petroleum products for storage in the Strategic Petroleum Reserve, including the Early Storage Reserve and the Regional Petroleum Reserve;

(F) store petroleum products in storage facilities owned and controlled by the United States or in storage facilities owned by others if such facilities are subject to audit by the United States;

(G) execute any contracts necessary to carry out the provisions of such Strategic Petroleum Reserve Plan, Early Storage Reserve Plan, proposal or amendment;

(H) require any importer of petroleum products or any refiner to (A) acquire, and (B) store and maintain in readily available inventories, petroleum products in the Industrial Petroleum Reserve, pursuant to section 156;

(I) require the storage of petroleum products in the Industrial Petroleum Reserve, pursuant to section 156, on such reasonable terms as the Administrator may specify in storage facilities owned and controlled by the United States or in storage facilities other than those owned by the United States if such facilities are subject to audit by the United States;

(J) require the maintenance of the Industrial Petroleum Reserve;

(K) maintain the Reserve; and

(L) bring an action, whenever he deems it necessary to implement the Strategic Petroleum Reserve Plan, in any court having jurisdiction of such proceedings, to acquire by condemnation any real or personal property, including facilities, temporary use of facilities, or other interests in land, together with any personal property located thereon or used therewith.

(g) Before any condemnation proceedings are instituted, an effort shall be made to acquire the property involved by negotiation, unless, the effort to acquire such property by negotiation would, in the judgment of the Administrator be futile or so time-consuming as to unreasonably delay the implementation of the Strategic Petroleum Reserve Plan, because of (1) reasonable doubt as to the identity of the owners, (2) the large number of persons with whom it would be necessary to negotiate, or (3) other reasons.

PETROLEUM PRODUCTS FOR STORAGE IN THE RESERVE

42 USC 6240. Sec. 160. (a) The Administrator is authorized, for purposes of implementing the Strategic Petroleum Reserve Plan or the Early Storage Reserve Plan, to place in storage, transport, or exchange—

(1) crude oil produced from Federal lands, including crude oil produced from the Naval Petroleum Reserves to the extent that such production is authorized by law;

(2) crude oil which the United States is entitled to receive in kind as royalties from production on Federal lands; and

(3) petroleum products acquired by purchase, exchange, or otherwise.

(b) The Administrator shall, to the greatest extent practicable, acquire petroleum products for the Reserve, including the Early Storage Reserve and the Regional Petroleum Reserve in a manner consonant with the following objectives:

(1) minimization of the cost of the Reserve;

(2) orderly development of the Naval Petroleum Reserves to the extent authorized by law;

(3) minimization of the Nation's vulnerability to a severe energy supply interruption;

(4) minimization of the impact of such acquisition upon supply levels and market forces; and

(5) encouragement of competition in the petroleum industry.

DRAWDOWN AND DISTRIBUTION OF THE RESERVE

42 USC 6241. Sec. 161. (a) The Administrator may drawdown and distribute the Reserve only in accordance with the provisions of this section.

(b) Except as provided in subsections (c) and (f), no drawdown and distribution of the Reserve may be made except in accordance with the provisions of the Distribution Plan contained in the Strategic Petroleum Reserve Plan which has taken effect pursuant to section 159(a).

(c) Drawdown and distribution of the Early Storage Reserve may be made in accordance with the provisions of the Distribution Plan contained in the Early Storage Reserve Plan until the Strategic Petroleum Reserve Plan has taken effect pursuant to section 159(a).

(d) Neither the Distribution Plan contained in the Strategic Petroleum Reserve Plan nor the Distribution Plan contained in the Early Storage Reserve Plan may be implemented, and no drawdown and distribution of the Reserve or the Early Storage Reserve may be made, unless the President has found that implementation of either such Distribution Plan is required by a severe energy supply interruption or by obligations of the United States under the international energy program.

(e) The Administrator may, by rule, provide for the allocation of any petroleum product withdrawn from the Strategic Petroleum Reserve in amounts specified in (or determined in a manner prescribed by) and at prices specified in (or determined in a manner prescribed by) such rules. Such price levels and allocation procedures shall be consistent with the attainment, to the maximum extent practicable, of the objectives specified in section 4(b)(1) of the Emergency Petroleum Allocation Act of 1973.

Rules.

15 USC 753.

(f) The Administrator may permit any importer or refiner who owns any petroleum products stored in the Industrial Petroleum Reserve pursuant to section 156 to remove or otherwise dispose of such products upon such terms and conditions as the Administrator may prescribe.

COORDINATION WITH IMPORT QUOTA SYSTEM

SEC. 162. No quantitative restriction on the importation of any petroleum product into the United States imposed by law shall apply to volumes of any such petroleum product imported into the United States for storage in the Reserve.

42 USC 6242.

DISCLOSURE, INSPECTION, INVESTIGATION

SEC. 163. (a) The Administrator may require any person to prepare and maintain such records or accounts as the Administrator, by rule, determines necessary to carry out the purposes of this part.

Recordkeeping.
42 USC 6243.

(b) The Administrator may audit the operations of any storage facility in which any petroleum product is stored or required to be stored pursuant to the provisions of this part.

(c) The Administrator may require access to, and the right to inspect and examine, at reasonable times, (1) any records or accounts required to be prepared or maintained pursuant to subsection (a) and (2) any storage facilities subject to audit by the United States under the authority of this part.

NAVAL PETROLEUM RESERVES STUDY

SEC. 164. The Administrator shall, in cooperation and consultation with the Secretary of the Navy and the Secretary of the Interior, develop and submit to the Congress within 180 days after the date of enactment of this Act, a written report recommending procedures for the exploration, development, and production of Naval Petroleum Reserve Number 4. Such report shall include recommendations for protecting the economic, social, and environmental interests of Alaska Natives residing within the Naval Petroleum Reserve Number 4 and analyses of arrangements which provide for (1) participation by private industry and private capital, and (2) leasing to private industry. The Secretary of the Navy and the Secretary of the Interior shall cooperate fully with one another and with the Administrator; the Secretary of the Navy shall provide to the Administrator and Secretary of the Interior all relevant data on Naval Petroleum Reserve Number 4 in order to assist the Administrator in the preparation of such report.

Report to Congress.
42 USC 6244.

ANNUAL REPORTS

SEC. 165. The Administrator shall report to the President and the Congress, not later than one year after the transmittal of the Strategic Petroleum Reserve Plan to the Congress and each year thereafter, on all actions taken to implement this part. Such report shall include—

Report to Congress and President.
42 USC 6245.

(1) a detailed statement of the status of the Strategic Petroleum Reserve;

(2) a summary of the actions taken to develop and implement the Strategic Petroleum Reserve Plan and the Early Storage Reserve Plan;

(3) an analysis of the impact and effectiveness of such actions on the vulnerability of the United States to interruption in supplies of petroleum products;

(4) a summary of existing problems with respect to further implementation of the Early Storage Reserve Plan and the Strategic Petroleum Reserve Plan; and

(5) any recommendations for supplemental legislation deemed necessary or appropriate by the Administrator to implement the provisions of this part.

AUTHORIZATION OF APPROPRIATIONS

42 USC 6246. Sec. 166. There are authorized to be appropriated—

(1) such funds as are necessary to develop and implement the Early Storage Reserve Plan (including planning, administration, acquisition, and construction of storage and related facilities) and as are necessary to permit the acquisition of petroleum products for storage in the Early Storage Reserve or, if the Strategic Petroleum Reserve Plan has become effective under section 159(a), for storage in the Strategic Petroleum Reserve in the minimum volume specified in section 154(a) or 155(a)(2), whichever is applicable; and

(2) $1,100,000,000 to remain available until expended to carry out the provisions of this part to develop the Strategic Petroleum Reserve Plan and to implement such plan which has taken effect pursuant to section 159(a), including planning, administration, and acquisition and construction of storage and related facilities, but no funds are authorized to be appropriated under this paragraph for the purchase of petroleum products for storage in the Strategic Petroleum Reserve.

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